THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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THE WEEK IN IRON CIRCLES.

General Features.

The situation, both at home and abroad, grows more interesting hourly. Direct reports from Glasgow to our Louisville correspondents (Messrs. Hall Bros. & Co.) state that prices there have advanced so that there is no chance for shipments into this country, and that the industries there have reached a state hardly ever approached, and consumption exceeds anything ever before seen. The Glasgow correspondent further states that there is an iron famine and the only available stock of iron on hand in that country is iron in store, and within the last two months 60,000 tons have been ordered out. Our reports from leading trade centers in the Central West are as follows: Louisville—"Trades have been frequent during the past week, but not in such large quantities as ten days or two weeks ago, partly for the reason that there is very little iron offering, and on the other hand, a number of the largest consumers have filled up their requirements for some time to come. The main cause, however, has been the unwillingness on the part of the furnaces to engage ahead. It is thought that prices will advance considerably in the near future as it is felt that the prevailing condition of things will warrant it." St. Louis—"There have been inquiries for Southern coke irons during the week, but none of the agents appear to be authorized to sell even at full figures. The latest reports from Birmingham are that No. 1 and 2 foundry have sold at $16 and $15.50 cash f. o. b. at furnaces. Heavy buying is expected. Chicago—"The backwardness in taking hold at the advanced prices seems to have about worn off, and buyers are coming into the market freely for their wants during the early part of next year. This is giving an increased volume of trade upon an already strong market. Ohio softeners are in better request and Lake Superior charcoal iron has been selling so freely that an apparent scarcity is developed." Cincinnati—"The pig iron market has been strong, with an advancing tendency which shows, at the close of the week, prices to range 50 cents per ton higher than last week. The inquiries, especially for grey forge pig iron, have been far beyond the ability of sellers to supply, there being scarcely any iron to be had from the South for delivery for 1889, and very few furnaces willing to sell beyond this year. One prominent company announces a willingness to sell a limited amount for delivery during the first half of next year, at prices equal to $18.50 cash, at Cincinnati, for No. 2 foundry, and $17.50 for grey forge. Sales have been made this week on the basis of $17, cash, for grey forge. Car wheel iron is held firm, under the prospect of a large demand from car builders." Detroit (W. F Jarvis & Co.)—"The sales have been above the average, and for prompt delivery at outside quotations. Several Mahoning Valley furnaces have withdrawn from the market and cannot book any orders for this year's delivery, and have not yet decided as to their figures for 1890. There is a growing feeling that another advance will take place before January 1st. Lake Superior charcoal are shipping iron as fast as made, and, in most cases, are refusing to quote any price for delivery ahead. Bessemer iron is very scarce and quotations are higher by from $1 to $2 per ton." Buffalo—"The advance in prices during the week has been caused by a stronger demand than the furnaces are able to supply. Extent of delivery is still held to the first part of next year."

Iron Ore.

The past week has witnessed transactions in the iron ore market of such far-reaching consequences as will mark it as the most important period since iron ore was first discovered in the Lake Superior district. The result of the week's business finds its culmination in the well-assured statement that of the estimated output, for 1890, of 9,000,000 tons of ore, 3,000,000 have been disposed of at an advance over the price of 1889 of from seventy-five cents to $1.25 a ton, while in some instances the advance demanded is $1.50. There has been no corresponding advance in charters, and the benefit is one accruing chiefly to the mining interests. The causes leading to this gratifying state are those already cited in these columns some weeks ago, by way of forecast, and which since then have become verified. American consumers of foreign ores will be unable next year to obtain their usual supplies, first, because of high ocean freights, and, further, because all the ore that can be produced on the other side in 1890 has already been engaged by the English furnace interests. This assurance of the necessary increase in the home consumption of Lake Superior ore, taken in connection with the largely stimulated activity in the iron market and a proportionate energy in the conversion of pig metal into other forms of merchantable iron, is the legitimate cause for the advance in the price of iron ore. There is a noticeable absence of any speculative feature, while the inquiry on the part of capitalists for the control of dividend-bearing mining stocks is on the increase. The latest transfer of this character recorded is that of the controlling interest in the Aurora mine to the Schlesinger syndicate, although, for the purposes of negotiation, a Mr. Weil has figured as the purchaser. The business cannot as yet be said to have been concluded, inasmuch as the money has not been paid over. The Aurora property is capitalized for 100,000 shares, and the price to be paid for the majority stock is said to approximate $7 a share. The mine produced this year 200,000 tons, and will next year ship a quarter of a million. The Aurora ore is among the best-known Gogebic Bessemer hematites, and sold some of its 1890 product this week at $6 a ton, which is an advance of $1. Among others, Chapin is selling at $5.50, Dunn at $4.50, Pence and Hennepin at $6.25 and Republic will probably be held at $7.

Pig Iron.

Every day sees a reduction of the visible supply of pig iron, and every week adds half a dollar a ton to the price whenever the mill and foundry men must enter the market. At present the furnace-men have little or nothing to sell for immediate delivery, and don't care to sell for future delivery, while the consumers of pig iron are on the anxious seat, afraid to pay a dollar a ton more for their iron for which eventually they will pay several dollars more. The conditions governing the market are healthy, trade is brisk, collections are good and the tone of the market is very strong. The most remarkable feature of the times is found in the unprecedented increase in the consumption of pig iron, far outstripping all resources of manufacture, and yet barely meeting the demand from further consumers in the diversified lines of the iron industry. An offer to purchase 2,000 tons of Bessemer iron for April delivery at $23.75 cash at a Mahoning valley furnace has been declined, and the cash price in Cleveland of an all-ore, strong No. 1 foundry pig is in the vicinity of $19.50 for what little there may be for sale from day to day in excess of contract orders.

Merchant Iron.

The price of bar iron continues at $1.80@1.85, and the demand is exceedingly strong, while sheets are quite scarce at $3.25 for No. 27, with the mills six weeks behind orders. Gas pipe is scarce, but there has been no change in price since October 15. There is less inquiry for combination shapes but it is reported that the 3.2 rate is soon to be advanced two-tenths.

Hardware.

Dealers say they are too busy to quote prices, which ought to be accepted in the nature of a wholly satisfactory condition of affairs as far as they are concerned.

SELFISH STEEL-MAKERS.

Major L. S. Bent, President of the Pennsylvania Steel Company, is quoted as saying: "Give me free ore and I'll sell pig iron in Liverpool and send steel rails to London. What American industries most want is free opportunity, and not legislative protection nor restriction." Major Bent is ingenuous. He speaks for himself, not for the great body of iron and steel makers or iron ore producers East, West and South. He is at the head of a great concern that, under a protective policy, has been built up from a capital of $200,000 in 1865, to a plant worth $4,500,000. Moreover, this same company is building immense steel works at Sparrow Point, near Baltimore, that will consume 1,000,000 tons of Bessemer ore per annum. This ore it expects to obtain from its extensive Cuban mines. These mines it purchased some years ago with a view to consuming their product in the United States; and the advocacy of free raw materials is directly in line with the whole anti-American policy which has been pursued by this company for years. We do not say that the purchase of these Cuban mines, the employment of cheap foreign labor and the building of steel works at tide-water were parts of a plan having in view the abolition of the present duty on iron ore, thereby crippling the iron mining industry of the South, West and Northwest, but it looks very much that way when its chief officer makes use of the Free Trade Philadelphia *Record* to air his views. The Pennsylvania Steel Company has a perfect right to purchase as many Cuban mines as it wishes and to build as extensive steel works at tide-water as it is able; but it has no right to speak for the iron trade of this country, or of Pennsylvania, or of the East. It speaks simply for itself.

HANDS OFF THE IRON TRADE.

The Iron Trade Review has heretofore stood almost alone in its opposition to the "unholy alliance" of the American Pig Iron Storage Warrant Company and the New York Metal Exchange in the interest of promoting speculation in pig iron; but it is now pleased to have the support of such influential papers as the Chattanooga *Tradesman* and Philadelphia *Iron*, which are entitled to speak with authority for their respective sections. Quoting from *Bradstreet's* of November 23, in which a speculative movement was reported in Southern irons, the *Tradesman*, in its current issue, says:

We have not observed the speculative movement referred to in this quarter and we conclude that it has its center of manipulation at the New York Metal Exchange. If our furnace-men go into it they may kill the goose that now lays golden eggs for them in three months. Any cornering of stocks to force the rise unnaturally will be followed by a reaction, and the more complete the corner the more violent the tumble. Consumers cannot be kept in ignorance of the amount of stock held in store or by furnace men direct. A hand-to-mouth plan of buying early next year would knock prices down, provided stocks shall then be abnormally large. The *Tradesman* is conservative, and after their experience with the speculative movements of 1880 and 1887, we wonder that iron men will lend themselves to another similar attempt to create artificial stringency of supply and consequent high prices above the natural movement. The present satisfactory condition of the market can be made the reverse of what it is in a short time, or it may be continued for a year or more, just as the furnace-men will. They will make more money by going ahead conservatively and legitimately than they can by joining hands with gamblers.

These are honest, straightforward and manly words and are the more significant in view of the previous friendly position of the *Tradesman* with reference to the progenitor of this forced speculative movement, the American Pig Iron Storage Warrant Company.

Likewise conservative in expression, but none the less forcible in statement, is this from *Iron*, of Philadelphia, which we find impossible to cut down without marring:

When the American Pig Iron Storage Warrant Company was organized, a year or two ago, it will be remembered that one of the principal arguments it brought forward for the support of its scheme of accumulating and storing stocks of pig iron was that the effect of large stocks, at convenient points, would be to steady the market for this commodity and prevent, the sudden and violent fluctuations in prices which have frequently disturbed the pig iron market in this country. It was urged that, in times of active and increasing consumption, the knowledge that there were large reserve stocks of pig iron upon which consumers might draw, would prevent furnace owners from rapidly raising their prices, and thus tempting many inactive furnaces, which could not be economically operated in ordinary periods, to again enter the field and rapidly demoralize the market in their eager competition for business. Likewise, in periods of trade depression, when consumption should be falling off, it was argued that furnace-men, knowing that the warrants issued for their stored pig iron were easily negotiable in financial centres, would be relieved of the necessity of unduly cutting their prices, or perhaps of blowing out their furnaces. The result of a general support of this storage scheme would, therefore, be to secure a more uniform and satisfactory tone to the market than has hitherto characterized it.

The American storage company, although it has secured a fair measure of support, has not yet attained a position to greatly influence the pig iron market of this country. If we look to Great Britain, however, we shall find that a similar scheme, and one after which that of the American company was planned, has been in force for many years. Hence, we should expect to find the argument of the American company, above outlined, supported by the course of the British pig iron market. And what has been the course of this market in the last few months? The stocks of pig iron in British warrant stores have recently approached 2,000,000 tons, or nearly three months' supply at the present rate of consumption in that country. Yet a standard brand of pig iron, which is selling to-day in Great Britain at 77½ shillings per ton, could have been bought in July for 54 shillings per ton. Here we have a rise in price in the short period of four months of 23½ shillings, or over 43 per cent. Other grades of iron have shown a similar rapid increase in price. During the last five weeks Cleveland No. 3 pig has advanced from 45¼ shillings to 68 shillings, or 50 per cent. All of these brands are of the same character as the iron stored with the warrant companies. The record of the American pig iron market, without the safeguard of warrant stocks, will be searched in vain for evidence of a similar rapid increase. The speculative element is partly responsible for these inflated prices in Great Britain, and this element the storage scheme does not antagonize, but rather aids.

We refer to this subject now, not in a spirit of antagonism to storage warrant companies, but rather to point out the necessity of their adopting more effective measures than they seem to have done, if they would make one of their main arguments a potent factor in winning the support of pig iron makers in this country.

Recently we had occasion to quote from our foreign exchanges in refutation of the claim of the *Age of Steel*, that a similar speculative movement was considered beneficial to the English markets. Two or three issues of our St. Louis contemporary have since appeared and we fail to observe any further reference to the matter. Has the subject lost its interest to our friends on the banks of the mighty Mississippi?

BACKED by the confirmatory evidence of the Medico-Legal Society, the authorities of the State of New York, in the adoption of an execution current and in the decision of the Kemmler case, the leading scientific papers, the New York Health Department and the greatest scientist of the age (see Thos. A. Edison's article in November *North American Review*), Mr. Harold P. Brown, electrical engineer, of New York, declares that "the alternating current has been in extensive use for less than two years, and yet it has killed at least forty persons. On the other hand, arc light currents have been widely used for the past ten years. During this time the high-tension continuous current has killed but ten persons, and the high-tension pulsating current, sixty. There has never been a single death caused by the low-tension continuous current, which all companies are free to use." Concerning the remedy, Mr. Brown says: "All arc light currents may be made safe by proper precautions, without cutting the pressure down to the limits advised, but unless some device can be invented which will guard against the effects of induction, the high-tension alternating current should be prohibited. The only reason that the deadly alternating current is used is that the electric light companies may economize in wire at the expense of public safety."

THE discussion of the Lake Erie and Pittsburgh Ship Canal takes on new interest daily. Recently in the Pittsburgh *Dispatch*, Colonel James Andrews, the well-known contractor, of Allegheny, and associated with the late Captain James B. Eads in the Tehauntupec ship railway scheme, proposed in lieu of a canal between Pittsburgh and Lake Erie, a grand four-track freight road capable of transporting 300, or even 500, tons of ore, coke or coal in single cars. Colonel Andrews feared there would be trouble in finding a sufficient supply of water for the canal, and anticipated a much greater cost in construction for that plan than would be required for a railroad such as he proposed. This has called out Colonel Roberts, one of the canal commissioners, who asserts that the water supply for such a canal would be more than sufficient for all needs, and, moreover, intimates that the proposed ship railway, if not impracticable, at least will not "hold water," or words to that effect.

WHAT *The Iron Trade Review* recently intimated as a possible solution of the World's Fair problem seems looming up within the realm of probabilities. The citizens of Washington are going ahead with the scheme of raising a $15,000,000 guaranty fund, one-half of which they count on the government taking. Should the fight between New York and Chicago grow too bitter, we believe a happy solution would be the choice of Washington. Indeed, there are many points in favor of the National Capital aside from any outside considerations.

TRADE journalism has been wisely recognized in the make-up of the New York World's Fair Committee, Mr. Frederick E. Saward, of

the *Coal Trade Journal*, having in charge the subscriptions among the coal men, and Mr. E. C. Brown, of the *Progressive Age*, having to do with the gas fraternity. No better selections could have been made to represent these two important branches of industry.

CARNEGIE, PHIPPS & Co., of Pittsburgh, have occasioned considerable remark by purchasing 2,000 tons of Bessemer pig made at Talladega, Ala., for the purpose of giving it a practical test at their Homestead Steel Works. The Montgomery *Advertiser* says the price paid was $17.50 per ton, but this figure the Chattanooga *Tradesman* is inclined to doubt, as the Carnegie furnaces can produce No. 1 Bessemer pig at a cost not to exceed $16 per ton. The Talladega ore is said to be very closely allied with the Cranberry ore of North Carolina, but the extent of the deposit has yet to be demonstrated.

WE are pleased to know that the Detroit International Fair and Exposition was a success financially, and that arrangements are already being made for the fair of 1890. It will be held in Detroit August 26 to September 5, and if anything is left undone to insure success, it will not be the fault of the efficient secretary, Mr. E. W. Cottrell.

THE improbable story that Krupp, the great German gun-maker, was soon to erect extensive steel works in Pennsylvania, has received early refutation. Governor Lee, of Virginia, wrote Herr Krupp, inviting him to locate in that State, and in reply was informed that the Carnegie of Germany had no thought whatever of building works in the United States.

SHEFFIELD, Ala., is now shipping pig iron to St. Louis by river, for the first time, making a saving of $1 per ton ton on freight.

THE proposed wire trust seems to have gone glimmering, for sure.

FIRE PROTECTION IN MANUFACTORIES.

At the recent meeting of the American Society of Mechanical Engineers, in New York, Mr. C. J. H. Woodbury read an interesting paper on "Methods of Reducing Fire Loss." His paper may be divided into three parts—supervision, construction and fire apparatus. In a manufactory valuable results may be obtained by an inspection of the whole property made on Saturday afternoon by two men, such as foremen or overseers of rooms, who may be appointed to serve four weeks, their assignment terminating on alternate fortnights.

The method of mill-building known as slow-burning construction combines the advantages of low initial cost and great resistance to destruction by fire, the final result being that the manufacturing is housed at the minimum annual cost. The fundamental principle of such construction is to mass the material in such a way that there shall not be any concealed spaces about the structure and that the numbers of projections of timbers, which are more easily ignited than the flat surfaces, shall be reduced as far as possible; that iron portions of the structure shall not be exposed to the heat of any fire in the contents of the building; and, furthermore, that the isolation of the various portions, both in respect to that of one building to another and of the various rooms and stories of the same building, shall be as complete as is feasible.

The best form of fire-door is that made of two thicknesses of matched boards, placed at right angles to each other and nailed together, being covered on the outside by tin securely locked together and held to the door by numerous hanging strips. The door should be secured to the hangers by means of bolts and not screws, and the rail upon which it runs strongly bolted to the wall. When closed, such a door should fit into a jamb and be securely held in this manner against the wall. Such doors are frequently hung upon an inclined track, and by some application of highly-fusible solder at the catch are so arranged that they will be closed by the heat of a fire if not closed by hand.

The practical results of private fire organizations, where fire has occurred, have been very marked; and systematic and skillful work has been the rule, in place of the needless confusion and liability to breakage of the apparatus, which almost inevitably occurs in the lack of such organization.

Buckets of water are the most effective fire apparatus. Automatic sprinklers have proved to be a most valuable form of fire apparatus in operating with great efficiency at fires where their action was unaided by other fire apparatus, particularly at night. Although automatic sprinklers have proved to be so reliable and effective, yet, in order to provide for all possible contingencies, their introduction should not displace other forms of fire apparatus, particularly stand-pipes in the stair-way towers, with hydrants at each story. Fire pumps are generally too small for the work required of them, 500 gallons per minute being the minimum capacity recommended.

In the discussion of this paper several interesting points were brought out concerning fire protection. It was stated that in one case when automatic sprinklers had begun their operation on a fire which had been reduced to a smoldering condition, and would be completely extinguished in a short time, the water department of the town appeared, attached their apparatus to the same pipe which supplied the sprinklers, and taking all water from the latter the fire again started up and the building burned down. President Towne stated that, in his experience, he had once had a fire caused by spontaneous combustion, in the paint shop, which was spread by the employment of too much water, upon which the burning oils were floated to other parts of the works. He described a paint shop made with a pit some two or three feet below the surface of the ground. In case a fire started in the shop the oil is confined to the pit, and the spread of the fire is prevented.

Another instance was given in which japan receptacles were inclosed in a chimney, the lower part of which was closed with a side door, while the top of the chimney was provided with a cover in order to keep out the rain. A string extended across the receptacle, and was attached to the lower door and also to the top cover. In case of a fire the string burned, closed the lower door and opened the upper door, which was suitably weighted, thereby carrying an upward draft, and confining the fire to the interior of the chimney.

Tin-Plate Manufacture in the United States.

That tin-plate manufacture has become an accomplished fact in the United States, recent advices from Pittsburgh would seem to leave very little doubt. This is an enterprise upon which the American mind has long been bent, and it is not easy to see what serious difficulty stands in the way of its taking root in the country. If the undertaking were delayed through the lack of skilled labor, that is an obstacle which a few months could easily remove, for there must be many hundreds of good workmen in South Wales who would be found ready to cross the Atlantic for the higher wages which their services would command in the United States. Then there is the certainty that as soon as ever the industry is fairly started, the Government will be willing enough to give it all needful protection by placing a prohibitive duty on imported tin-plates. This is a very agreeable prospect for the American tin-plate manufacturer, but it is a very doleful one for the British maker, who is at last confronted by the impending loss of a market of which he has for many years enjoyed the exclusive monopoly. This is an event which has been long predicted, but its realization, though often threatened, has been delayed until now.

According to the statement of a Pittsburgh contemporary, this new departure was successfully entered upon a few weeks since at the Exhibition, which is being held in that city, and an article has been turned out which, it is said, completely eclipses the material produced in South Wales. This latter allegation is probably a harmless exaggeration on the part of the Secretary of the newly-formed American Tinned-plate Association, but, as regards the successful inauguration of the industry itself, there is but too much reason to fear that the narrative is accurate enough. The plant is in charge of two experienced tin-plate workers, who have been brought from South Wales, and, as tin-plate manufacturers possess no secrets with respect to their processes, we may be certain that the Association has fully gauged the probabilities of success, and that tin-plate manufacture is at last fairly started by our American friends.—[London Coal & Iron Trades Review.

Exploding Either Way.

The boiler explosion which cost two lives yesterday, at the Duquesne Steel Works, demonstrated one point which is of interest and importance in determining the causes of boiler explosions. The experiments which were made at the Munhall farm several years ago demonstrated that boilers containing a large amount of superheated water could be exploded by a sudden relief of pressure; and it was claimed that the old idea of exploding boilers by letting the water get too low and letting in fresh water on the hot surface was disproved. So strong was this belief in some minds that the expert agent of a boiler insurance company offered to sit above a red hot empty boiler while water was turned into it. Yesterday's explosion, however, was clearly produced by letting the boiler heat while empty and then turning the water on. It looks as if either too hot or too cold water can produce explosions at unexpected moments.—[Pittsburgh Dispatch.

Soft Bar Steel from Old Rails.

Edwin G. Wassel, a roller employed at one of the Pittsburgh rolling mills, claims to be the author of an invention which, if found practicable, will prove of great value. The new discovery consists of a process of treating old railroad rails, so that they can be readily converted into a soft merchantable bar steel, suitable for horse-shoes and kindred purposes. The old rails are first treated in the furnaces and then rolled into billets through the muck rolls. These are then transferred to the bath furnace and submitted to a slag bath, after which they are removed and run through the nine-inch mill, whence they are turned out and put into merchantable shape. Experiments thus far justify the claims made by Mr. Wassel in behalf of his invention, and a company is in progress of organization for the purpose of operating the patent.—[Industrial World.

Scribner's Magazine for December is a Holiday number of striking beauty and attractiveness in its illustrations, and the text of the articles will appeal to the fancy and sympathy of readers, rather than to their desire for instruction in practical affairs. With the exception of the fourth installment of Harold Frederic's serial, each article is complete in this issue. The contents include a sympathetic study of life in the poorest quarters of New York's tenements; a vigorous end paper, sure to provoke discussion, by Edward J. Phelps. Esq., ex-Minister to England; a genial and discriminating review of the whole field of American humorous drawing, by J. A. Mitchell, the founder and editor of *Life;* another story by Mr. H. C. Bunner, editor of *Puck*, whose "Zadoc Pine," and "Squire Five-Fathom," in previous Christmas issues, will be recalled; a vivid and picturesque account of some characteristic Breton festivals; and a sunny picture of life and eccentric character on some of the least frequented of the Bahama Islands.

FACTORS OF SAFETY IN STEEL SHIPS.

BY JOSEPH R. OLDHAM, N. A.

[Continued.]

When a body floats on a fluid, it displaces as much of that fluid as is equivalent in weight to the weight of the whole body; the measure, therefore, in solidity, of the portion of the body that is immersed, will give the magnitude of the fluid displaced, and the weight of this bulk of fluid will give the weight of the floating body. If the body remains stationary, floating in still water, the strains to which it will be subject, whether extensive or compressive, will be constant or invariable, but in the case of a vessel sailing on the ocean, provision should be made to meet ever varying strains of much greater force, and still further must the longitudinal strength be increased in ships of even medium dimensions, if there is to be any factor of safety, when such are "stranded" or "grounded" on an uneven bottom.

Before considering some of the strains to which steam vessels are subject when riding the largest waves, it may be well to place before our minds the probable dimensions of such waves. Scoresby found the length of the highest waves in a violent gale of wind to be 640 feet, the height 42 feet and the velocity 56 feet per second, or about 33 knots an hour.

When a vessel is poised upon a rock situate at midships, she may be considered as a loaded beam, and if we knew the weight of the forward and after bodies loaded, and the longitudinal distance of the center of gravity of each, respectively, from midships, the product of these would be the maximum bending moment tending to destroy the vessel, which, either as a girder or a beam, has to resist its load by the compound or counteractive power of the tensile and compressing forces exerted by their particles mutually against each other on the opposite sides of the neutral plane.

Without much calculation and some data as to the distribution of the load, the exact moment of this force cannot be determined, but on comparing a number of loaded vessels, it has been ascertained that the center of gravity of either body is situate at an average distance of one-fifth of the moulded length from midships; therefore, one-tenth of the product of the displacement, length of the vessel and distance of the neutral axis from the gunwale will be the approximate bending moment tending to rupture the upper works of the vessel, and may be called the "ashore strain." The "afloat strain" varies materially with the form of the vessel, and is found to be less in vessels with an "easy" midship body than in those with a very flat midship section and fine ends, but for average cargo steamers it may be taken as one-fifth of the "ashore strain," and for the present purpose of *comparison* at least we shall not be far wrong in assuming it to be such.

Let us now consider a vessel with reference to her longitudinal strength, with the upper stringer, deck plating and top sides subject to an extensive, and the bottom and bilge to a compressive strain, such as may be experienced under ordinary circumstances in a seamary or in an aggravated form when the vessel is stranded and supported only (for an instant) by the smallest portion of the midship body resting on a rock after the water has receded; let it be assumed in the present paper, that the bottom is equal to the compressive force thus brought against it; the upper deck then corresponds to the bottom of a girder bridge, and the following tables and illustrations are intended to show the approximate maximum strain in tons per square inch on the point of the section furthest removed from the neutral plane or line.

The particulars of the following steamers, on which these calculations, by the writer, are based, were not merely gathered from books or builders' plans, for several of the vessels were designed by the author, and the others were inspected by him, either as superintendent for the owners, or as surveyor to one of the "Lloyds" associations.

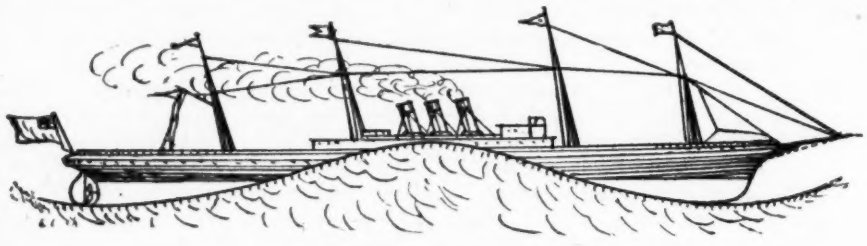
On referring to the annexed table, diagram and profile, it will be seen that the large steamer, 560 feet in length, when riding on a high wave, equal to her own length, is liable to a "hogging" strain of nearly 7¾ tons per square inch, on her upper works, the factor of safety being under two and three-quarters; of course, this vessel would be broken in two, long before the water receded, if she were poised on a rock, like the vessel shown under Fig. 4.

The steamer, 455 feet long, as per table, when at sea, is liable to a tensile strain on her gunwale, of practically the same amount as the above, but when stranded there is reason to suppose, judging from a casualty to one of the same fleet, that the bottom would succumb to compression before the topsides gave way, as these vessels are totally without intercostal keelsons, and have floors 29 inches deep by $\frac{11}{16}$ thick, spaced 25½ inches apart. The steel lake steamer, 297 feet in length, possesses an "afloat" factor of 4.25, and may be considered the strongest long steamer on the lakes, and with some slight addition to her topsides, similar to the annexed diagram, might be expected to float off the rocks after having been left almost dry.

Let us now consider a lake steamer slightly shallower than the last, and 308 feet in length. This vessel must inevitably be destroyed long before the water recedes, if placed on a rock, as shown in Fig. 4. The *Thornhill* might be expected to float off again, after stranding, as illustrated, and all the smaller vessels, from 225 feet down could be relied on to withstand the severest strain illustrated by profiles in this paper.

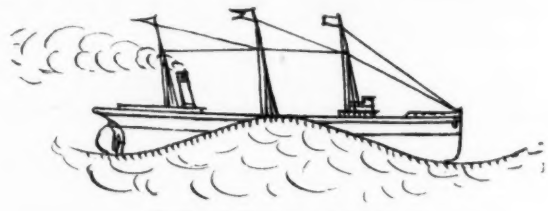
The diagram marked A will show the maximum strain at gunwale and factor of safety, of some twelve steamers, ranging from 170 feet to 560 feet in length, between perpendiculars. I may add that the average distance of the true neutral axis of these vessels, above the top of the keel, is $\frac{435}{1000}$ of the depth.

There is a growing and eager tendency on these lakes for much larger vessels than obtain at present, and properly so, for the same staff, almost the same crew, less first cost and less cost of fuel per ton, dead weight carried, would be required for a vessel carrying five thousand as for one carrying three thousand tons, and so it may not be many years before vessels of five or six thousand tons burthen are required on these lakes. When that time arrives a considerable departure will have to be made from the present system of construction, for it would be useless to make vessels any deeper than the modern steel lake steamers, which now sail with from forty to fifty per cent. more "free board" than similar vessels have on the ocean, and, as great breadth is the most extravagant way of increasing the dead weight ability, and is otherwise objectionable, there remains only one direction in which to move forward, and that is in the way of increased length, but of course this cannot be attempted to any great extent without largely adding to the longitudinal strength.



CITY OF ROME.

S.S. 560′x52¼′x39.8′ and 11.230 Tons Displacement.



STEAMSHIP 297′ LONG.

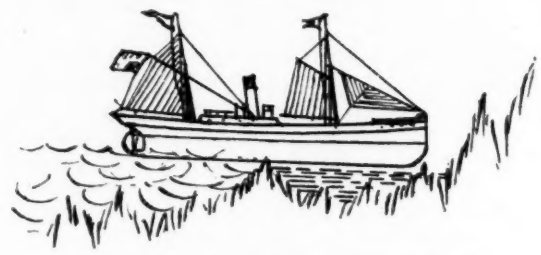
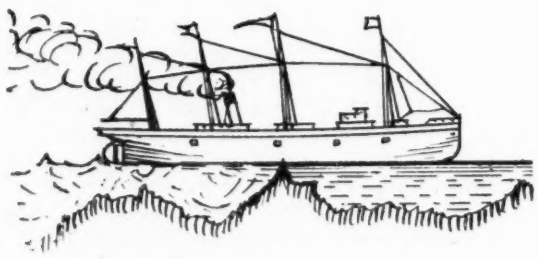
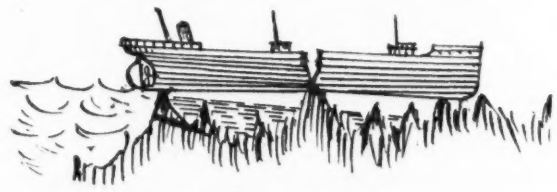


FIG. 4.—S.S. THORNHILL 245′x33′x22′.
Extreme Strain at Gunwale=20.48 tons per sq. in.



STEEL LAKE STEAMER 297′ LONG.

Grounded on Rocks Amidships, Extreme Strain at Gunwale=25.12 Tons per sq. in.



STEAMSHIP 308′ LONG.

Extreme Strain at Gunwale=39.45 Tons per sq. in.

APPROXIMATE MAXIMUM STRAIN AT GUNWALE AND FACTOR OF SAFETY.

	Length.	Depths to Length.	Ashore Strain.	Afloat Strain.	Factor of Safety.	Where Built.	Material.	Neutral Axis above Keel, in per cent. Depth of Hold.
	Feet.		Tons per sq. in.					Per cent.
City of Rome	560	14.07	38.57	7.716	2.723	Barrow.	Iron.	45
Germanic / Britannic	455	12.81	38.70	7.740	2.713	Belfast.	"	40
Lake Steamer	308	12 70	39 45	7.890	3.800		Steel.	40
"	297	11 60	3 .22	7.044	4.2 0		"	43
"	*297	11 60	25.12	5.024	5.970		"	46
Thornhill	245½	11.16	20.48	4.096	5.130	Jarrow.	Iron.	42
Lancashire Witch	225	15.80	15.87	3.174	8.820	Sunderland.	Steel.	45
Rosamond / Alpha	180	13 33	14.82	2.964	7.085	Rotterdam.	Iron.	47
Stuart	175	12 07	15.50	3.100	6.774	Preston.	"	44
Wolf	170	11.71	12.55	2.510	8.360	Flushing.	"	43

* With tubular waterway.

When considering a ship as a girder or a beam, the bottom presents no

difficulty, for by a judicious system of longitudinal cellular construction, this may be made amply strong to withstand either strain without materially increasing the depth of the water bottom, but when we come to the upper

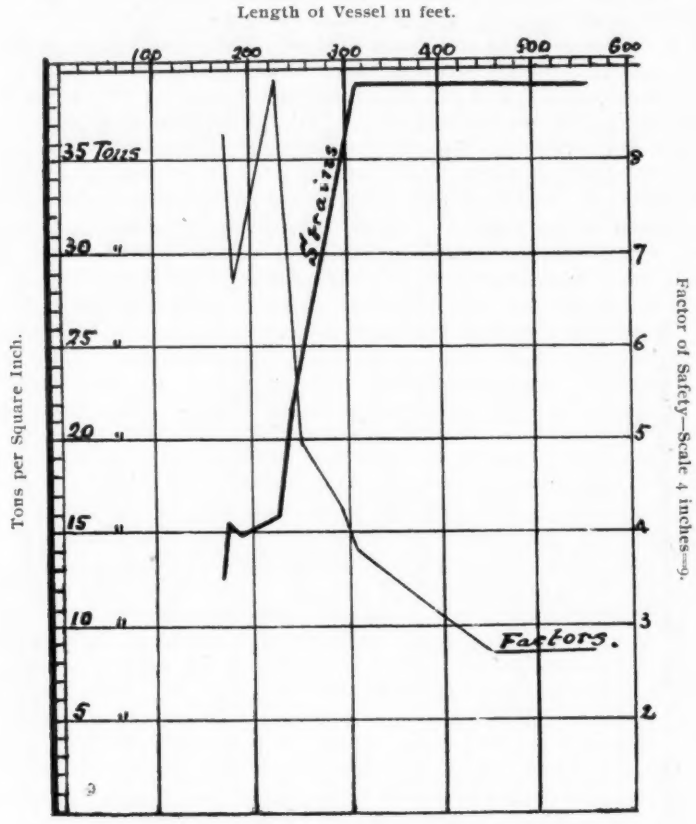
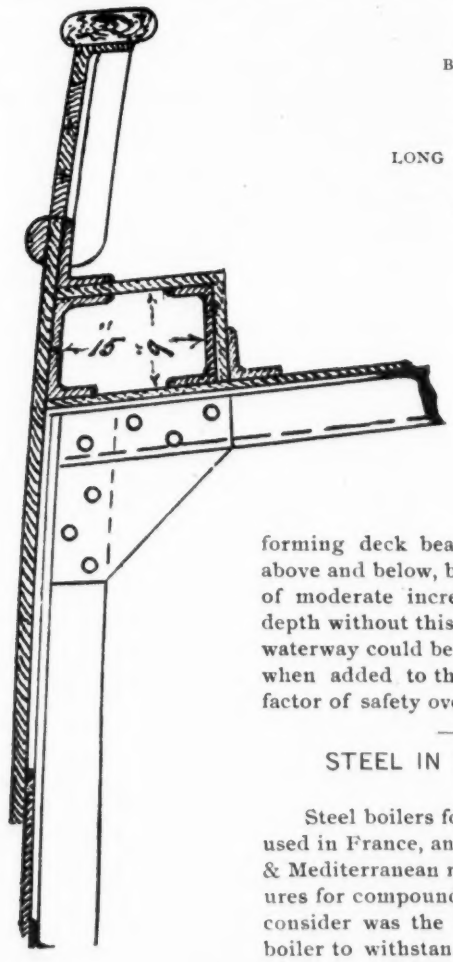


DIAGRAM A—APPROXIMATE STRAIN AT GUNWALE.

works, much more thought and experience will be required to make a strong vessel so as to load without any trimming. Possibly the whole of the decks at the sides of the hatchways will require to be made as a tubular girder, say, by



BOX WATERWAY

FOR

LONG STEEL STEAMERS.

Scale ¾"=1 foot.

forming deck beams of Z iron and plating these above and below, but much may be done in the way of moderate increase of length and reduction of depth without this, for, where necessary, a tubular waterway could be fitted as shown, such as which, when added to the 296-feet steamers, increases the factor of safety over forty per cent.

STEEL IN LOCOMOTIVE BOILERS.

Steel boilers for locomotives are not generally used in France, and when recently the Paris, Lyons & Mediterranean road decided to use higher pressures for compounding, one of the first matters to consider was the material and construction of a boiler to withstand such pressures. It was decided to use steel because of its greater strength, but there were some doubts of its reliability. In the light of our experience with steel boilers, these fears seem out of place; yet the steps taken to secure good steel show how carefully such matters are considered in France, and some American boiler makers could profit by the methods there used.

The specifications for the steel required a mininum strength of 59.735 lbs per square inch, and a minimum elongation of 26 per cent. in pieces 7.87 in. in length. It is noticeable that no maximum strength was specified, as is customary in the United States.

In working the steel, great precautions were taken to prevent injury to the metal. Punches were not allowed; all holes were drilled. All flanges were turned with hydraulic pressure, and work was stopped on the steel sheets when they were lowered in temperature to a dark red color. After flanging, and after being fitted and drilled ready for use, and even when rolled into form, the sheets were placed in a large annealing furnace, about 1,200 cu. ft. in capacity, constructed especially for the purpose, in which they were annealed, and after that the use on them of a hammer for any purpose is carefully avoided. The holes were first drilled about 0.08 in. in diameter less than the diameter of the rivets, and after being put in place they were reamed to size. In annealing the sheets they were raised to a cherry red, and were kept at that temperature by a slow fire from 15 to 18 hours. At this time the cover of the furnace was slightly raised, the fire pulled out, and the temperature of the furnace and the sheets allowed to become reduced during the next 48 hours. The sheets were then removed from the furnace, and 12 hours after were put into position. Iron rivets were used, and driven preferably by hydraulic riveters.

This case of careful manipulation of steel sheets, with other instances of the kind which the traveling engineers saw this Summer, go to show that the French, German and English engineer has not that high confidence in sheets of that material which is possessed by the engineer in the United States. If it were not for the large number of steel boilers in use here, which run practically without cracking, or rupture of any sort, one might be somewhat concerned at the contrast between the scrupulous care taken by the foreign engineer, and the more free and easy methods of boiler construction here. But the rarity of accidents to the vast number of steel locomotive boilers running in this country, often carelessly handled, is good evidence of the general reliability of our methods. It is true that we do punch steel boilers, but they seem to be none the worse for it. It is also true that the majority of all of the sheets in our boilers are unannealed, yet only a few of the vast number ever fail by cracking. It may be, however, that we have a better class of steel sheets to deal with, and that the large d ma id for steel of a low tensile strength and a maximum elongation has fo ste ed the growth of and improvement of processes whereby we are able to obtain steel for the construction of boilers which has a uniformity in general characteristics that is almost unknown among boiler makers abroad.

Nevertheless, in spite of the good quality of steel which we are fortunate enough to possess, and the good fortune which seems to attend the construction of steel boilers—and their use as well—would it not be well to pay a little more attention to the matter of annealing steel sheets after they have been worked upon, particularly after they are flanged? Attempts are now being made to do this, and nearly all the modern locomotive specifications call for "All sheets to be annealed after flanging," but this is almost never done in the full sense of the term "annealed," or anything like it. It is no easy matter to anneal a steel sheet, and the mere heating over a wood fire for a short time, as the practice is in some localities here, not only does not properly anneal a sheet, but sometimes it is hardened by the sudden cooling allowed. There are many steel boilers now in use which are constructed of plates that have been flanged, but which are too large to enter any annealing furnace used for locomotive boiler work in this country. In some shops, however, steps are being taken to meet the demands of the regular specifications for locomotive boilers, notably at the Rhode Island Locomotive Works, where one of the largest annealing furnaces in the United States has been recently constructed, and is now in successful operation.—[Railroad Gazette.

An Oil Well Supply Combination.

At a meeting of oil well tool manufacturers at Oil City, Pa., an organization to regulate prices was formed. For several years prices have been low and profits correspondingly small, resulting from lively competition. The result was that manufacturers decided that a change was necessary. The membership of the organization includes nearly all the manufacturers of drilling tools, etc. The idea is to advance prices slightly and make all prices and discounts uniform. The new lists on prices will go into effect on December 1st. It is believed that as a result of this organization the price of drilling will be advanced.—[Age of Steel.

The above association met at Cleveland, on December 4th, for the purpose of perfecting an organization. Among the representatives present were M. Geary and K. Chickering, of Oil City; E. H. Ames, of Titusville; and C. H. Bagley, of Corry. The proceedings were private. The principal manufactories of oil well supplies are located in Erie, Oil City, Titusville, Bradford, Pittsburgh and Washington, Pa., with branches in all the oil towns of importance

A Model Shop-Lighting Plant.

The Westinghouse Machine Co. is engaged in putting an electric light plant into its establishment, so arranged, and of such capacity, as will make these works (if such a thing be possible) as light by night as they are by day. A combination of incandescent and arc lights will be used for the purpose. The former will be effectually distributed over the whole area of each department, and these will be supplemented with arc lights in all large spaces. The company is adding a complete force of night workmen, and as it is believed these workmen will henceforth here find continuous employment, it becomes important that the establishment shall have a permanent, abundant supply of light. If each machine is lighted independently, it is found that workmen cannot move about the shops to advantage in the gloom, and, in short, can not do as much work as the same force would by day. A reduction in product of only two per centum on a large force is important, and to save this on a night force is well worth the cost of maintaining a brilliant, abundant, general illumination of the establismment, if it can successfully be done.

WE are informed that Jacob Reese, of Pittsburgh, has interested a number of Louisville capitalists in his method of reducing old steel rails of heavy sections to light sections, fit for relaying. The experimental steps are being taken at the works of the New Albany Rail Mill Co., at New Albany, Ind., and subsequent operations will depend entirely upon the results shown there.—[Iron Age.

EXPLOSION OF AN OIL STILL.

The engravings illustrate an instructive explosion that took place some little time ago in Pennsylvania. The still was used only for the purpose of removing the lighter hydro-carbons, and it did not reduce the oil to more than sixty degrees specific gravity. There was, therefore, no liability to accident from burning, from deposit or from fouling of pipes and connections, as only a low degree of temperature was required. The generator which exploded was 21 feet in diameter and 8½ feet high from the bottom to the root of the roof flange, and was heated internally by 300 lineal feet of three-inch steam pipe. The upper head or roof was about 3 feet 3 inches high, and to it a dome was fitted that was 7 feet high, and 30 inches in diameter. The bottom of the still was flat, and was secured to the shell with 3″ x 3″ x ½″ angle iron. The bottom and shell plates were each $\frac{5}{16}$-inch thick, and the dome and roof ¼″. The vertical seams of the shell were double riveted.

The generator was supported upon a stone foundation consisting of 18-

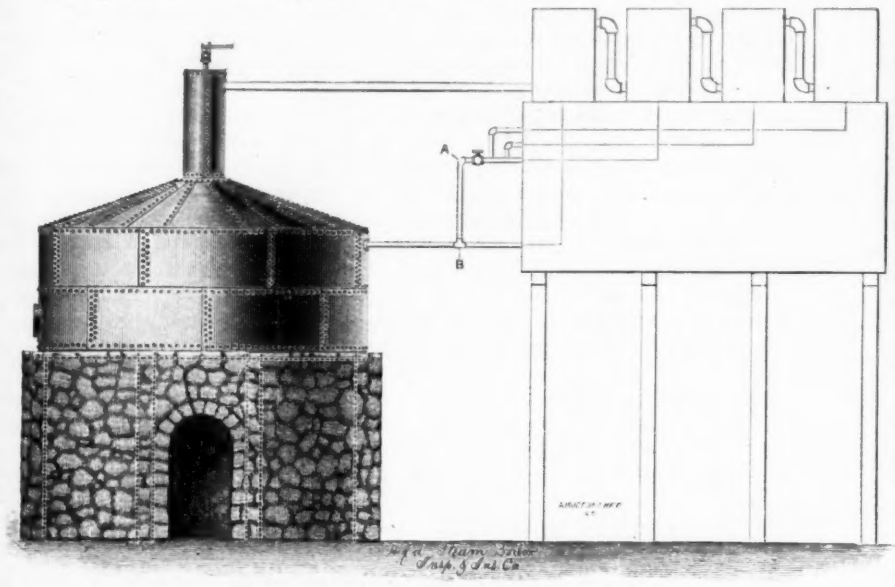


FIG. 1.—THE STILL BEFORE THE EXPLOSION.

inch walls with strong buttresses, and two division walls for central support; and crossing underneath it, and firmly and evenly bedded in all the walls, were bars of railroad track iron, to give an even and uniform support. All the work was new, and the accident took place during the third run, just at night. It was proposed ultimately to run the still under 10 to 15 lbs. of internal pressure, but at the time of the accident the ball had not yet been placed on the safety-valve, and as the weight of the lever was all that held the valve down, the pressure in the tank at the time of rupture could not have been greater than 1½ lbs. to the square inch. A heavy shower of rain was falling at the time, and a stiff wind was blowing, the initial rupture taking place upon the exposed side. The fracture was along the row of rivets in the bottom of the shell, and in the angle iron, the action being to tear the shell from the bottom through either the line of rivets or the root of the angle in the flange.

After the explosion the generator was found in the yard in the position indicated in Fig. 2. The dome was driven inward through the roof, as shown,

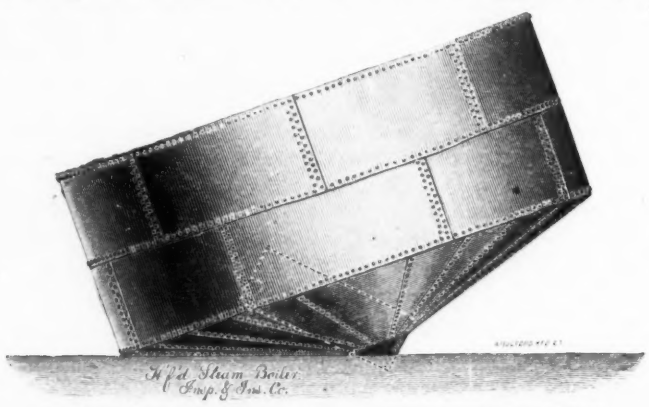


FIG. 2.—POSITION OF THE STILL AFTER THE EXPLOSION.

part of it also projecting downward into the ground. From the position of the wreck we infer that the generator must have been buckled in construction, so that it did not rest evenly and equally upon its seating; it may have been unsupported, therefore for many feet in its circumference, and for some distance inward, throwing a severe strain upon the angle iron and its connection to the shell. This view of the case was borne out by an examination of a duplicate still at the same works, which was found to rest upon the central portion of the bottom, this part held rigid by the weight of the pipe coils, while the outer edge of the still touched the seating at two or three points only, it was also borne out by the fact that, at the time of the first filling or run, the drip-pipe connection was broken at A and B, which would indicate that the generator had settled. The foundations showed no signs of having settled, save for a crack through the arch over each door. We understand, however, that these cracks were not visible before the explosion, so that they probably occurred at the moment when the explosion took place.

The primary cause of the accident, therefore, seems to have been the settling and consequent alteration of form, each time the still was used, throwing a severe strain upon the point ruptured. The plates were not of a quality suitable to withstand much strain or buckling, and no doubt the fracture was large and perhaps nearly complete some time before the accident, the final giving out of the structure being hastened by the contraction caused by the rain. The shell was not thrown to any distance, but merely tipped over into the position shown in Fig. 2, which would require but slight internal pressure, assisted by the wind and the steam escaping after the coil connections were broken inside.

Stills of such a size as this one should be constructed with great care, and should contain only the best material. In forming the angle iron that joins the shell to the bottom plates, everything should be made true and uniform, so that the shell can be attached without the use of drift-pins to draw the parts together. In order to effect this, drilled instead of punched holes would be necessary on this part of the work. Any distortion or buckling in so large a surface is greatly augmented when the generator is filled with oil. The bottom and sides are made rigid by the timbers and scaffolding placed within for the support of the coils, and hence, if there is a depression on one side, owing to a want of contact with the foundation, the strain would very naturally locate itself at the joint connecting the cylinder with the bottom. That a tendency to such deflection and strain would exist may be seen by the following figures: The weight of the contents of the generator, including the timbers and coils, and assuming the oil to weigh 55 pounds per cubic foot, would not be far from 80 tons. The unsupported part of the bottom would be subjected to a strain due to a considerable part of this weight, and, in our judgment, it is quite possible that this strain might be so distributed as to rupture the plates receiving it. After the crack or rupture had occurred, there was nothing to hold the cylinder to the bottom, through the ruptured section, and, as the area of the bottom of the tank was about 50,000 square inches, one pound of internal pressure per square inch would give a total pressure of 50,000 pounds, tending to separate the top of the generator from the bottom. Now, the weight of the cylinder and the top was only about 12,000 pounds, so that it is plain that with one pound of internal pressure per square inch, the lifting force exerted on the upper part of the generator and tending to lift it from the lower part would be over four times the generator's weight. The conditions were similar to those in a balloon. The generator would naturally begin to lift at the fractured portion and turn over in the opposite direction, the unfractured portion preventing its being lifted off the bottom bodily. The sudden gust of wind striking it on the west side, and the dash of rain suddenly cooling it off were efficient aids to the accident, no doubt, and the reaction of the steam, as it escaped from the broken coil connection, may have helped also.

In building and setting up sills of this size and description, the following precautions should be taken: The angle iron connecting the cylinder or shell to the bottom should be laid out with great care so that it shall lie on the bottom without rocking or buckling. The holes in the angle iron and the shell should then be drilled instead of punched, and care should be taken to have them coincide without being forced to make them do so by the use of drift-pins. In seating the tank upon its foundation, care should be taken to have complete contact at all points. It would be difficult to construct a still of such size as this with an absolutely flat bottom, and hence the necessity arises of paying careful attention to the seating in order that no part shall be left unsupported, so as to bring an undue strain on the more rigid portions. All places where there is not contact with the foundation walls should be grouted with good cement, and such places within the wall as do not rest firmly on the foundation should be "shimmed" up and made secure. A good quality of iron should be used in these large generators, and, in our judgment, the lower course of plates on such a one as this should be three-eighths of an inch thick. The angle iron, too, should be stouter—we should recommend 2½″ by 4½″, and ¾″ thickness. Lastly, it would be wise to brace such tanks from the bottom to the shell, with ¾″ iron braces, three feet or so in length, and about two feet apart.—[The Locomtive.

The Stability of the Forth Bridge.

Sir John Fowler, writing to an English contemporary, says: The Forth Bridge has a margin of strength and stiffness far beyond that of any other large bridge hitherto erected. With regard to carriages being blown off the rails, it will be a comfort to Mr. Kyle to know that the Board of Trade require side or wind fences and guard rails which would prevent carriages being blown off the rails, except by a hurricane, of which we have no knowledge, and which, if it occurred, would sweep every carriage off every embankment it passed over before the carriages passing the Forth Bridge were disturbed; or, in other words, the pressure of wind required to blow carriages off the rails when passing over the Forth Bridge would destroy St. Rollox chimney, and nearly every lofty buliding in the country.

A Machinist's Ingenious Device.

By his rare inventive genius a Collegeville machinist has suddenly come into possession of a snug fortune. His name is Claus H. Van Hagen, and he has devised a machine to forge twist drills, for which the Chester Twist Drill & Tool Co. has paid him $25,000 in cash and $65,000 in stock. In addition to this he has been appointed to the position of Superintendent of the Chester works for which he will receive a weekly salary of $50. He has all his life been a poor man, and during the thirteen years that he has been at work on his invention, he has gone into debt to the amount of $10,000 or more. He is a German by birth, having come to this country thirty years ago.—[Record (Philadelphia).

The Iron Trade Review, of Cleveland, and the *American Artisan*, of Chicago, are two ably edited trade weeklies, each thoroughly occupying the field they represent.—[American Implement Herald.

THE WELLS LIGHT.

This light, which is largely used in England and Europe in engineering shops, has just been introduced into this country by Messrs. Keegan & Halpin, Washington street, New York, who are the sole manufacturers. A short description of the light will be of interest, as it seems to supply a long-felt want. Portable light is a great desideratum in any smith shop or foundry. In a machine shop, gas or the electric light is best adapted, since the work is always in the same place and of the same character. In smiths or boiler shops, however, the work varies in character, position and size, and the same applies to heavy foundries. However well lighted either of these may be by any fixed system, it is impossible to adjust the light to the work, and some part of it is almost sure to be in shadow. To minimize this, much more light than is absolutely necessary has to be used; whereas, if a portable light could be empoyed it could be moved to suit the work, and half the fixed lights in the shop put out of use. It is already being employed largely in this country by firms whose shops are

FIG. 1.

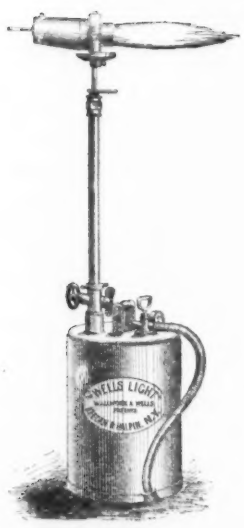


FIG. 2.

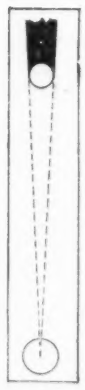


FIG. 3.

FIG. 4.

lighted either by electricity or by gas. They find it useful as an adjunct to these, and as a substitute in case of a break-down; while for over-time, mold-breaking, repairs and hurried work it is found indispensable. As a substitute for the electric light it has a great advantage in the softness of the shadow thrown; the light coming from the large flame is soft and diffused. The difference between the shadow thrown by an arc light and the Wells light flame is shown in the accompanying cuts, Figs. 3 and 4.

The light is produced from kerosene oil, and the form of the apparatus is shown in Fig. 1. It will be seen that the machine is entirely self-contained, and needs no power nor connections. It consists of an air-tight steel tank which holds the oil. A stand-pipe runs from the bottom of the inside of this tank to a generating burner placed four feet above it. Air pressure is produced above the oil in the tank by a few strokes of the hand pump placed in the crown of the lamp, so that when the valve is opened the oil is forced up the pipe by this pressure.

The burner is heated to start by the flame of a little oil placed in the dish beneath it, and, when hot, the supply of oil is turned on. It is immediately vaporized, issuing from the jet at the back of the burner, and passes through the generating tubes in a powerful, horizontal flame, which not only keeps the tubes hot, but gives an extremely powerful white light. The consumption of oil is very small in proportion to the light, as it is burned in the most economical way; that is, as vapor. In consequence of the small consumption of oil, the air pressure above it falls but slowly. If the lamp be started at 20 lbs. pressure about four hours elapse before it has fallen to eight pounds, and needs raising again by a few strokes of the hand pump. Either oil or air can be pumped in while the light is burning; so that the apparatus is practically continuous.

The horizontal position of the flame has been chosen because of the advantages which it offers in heavy weather out-of-doors. A vertical flame would be beaten flat and caused to flicker violently in a gale; but the horizontal flame of the Wells light can be swivelled to run down wind and so always remain steady.

The lamp is very strongly and simply made, and can be put into the hands of any unskilled laborer. The pump is protected from injury by being placed inside the tank from which it can be easily withdrawn for cleaning or repairs.

Many visitors to England, last Summer, must have seen these lights in use on the Manchester ship canal, which immense contract is carried on by night solely by the aid of 200 of these lights. It is also used in most of the large rolling mills, iron foundries and boiler works in England.

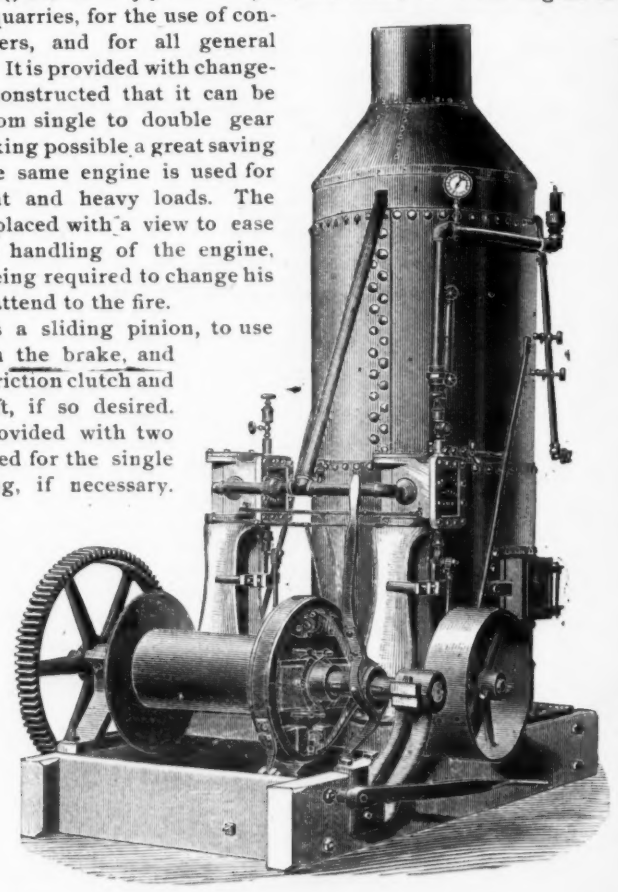
The light is made in three sizes; the first, or standard size weighs 150 lbs., uses about 1¼ gallons of 150° kerosene oil per hour, and gives a flame 2 feet long and 4 or 5 inches in diameter. The second, or "railroad size," has a smaller and lighter tank with a more powerful burner, and has been especially designed for extreme portability and power of light for wreck clearing, etc. The third size is a small hand lamp, weighing 40 pounds, working on the same principle as the two larger sizes, but burning only ⅝ gallons of oil per hour, and giving a flame about 18 inches long.

The manufacturers also make several modifications (Fig. 2), such as separate stands for the burner, which, in this case, is connected to the tank by flexible tube; portable lights raised on a mast 14 or 15 feet high, and various other designs. Two thousand lamps were sold last season in England, and we see no reason why they should not be a success here.

IMPROVED HOISTING ENGINES.

The accompanying cut represents an improved double cylinder, link motion, hoisting engine, built by John F. Byers, Ravenna, O. This engine is suitable for stone quarries, for the use of contractors and builders, and for all general hoisting purposes. It is provided with changeable gearing, so constructed that it can be instantly shifted from single to double gear and vice versa, making possible a great saving of time, when the same engine is used for hoisting both light and heavy loads. The working parts are placed with a view to ease and rapidity in the handling of the engine, the engineer not being required to change his position except to attend to the fire.

This engine has a sliding pinion, to use when lowering with the brake, and can be fitted with friction clutch and winch head on shaft, if so desired. It can also be provided with two drums, both arranged for the single and double gearing, if necessary.



The fly wheel can be used to drive a belt, for pumping or other purposse where a belt is required. The sliding pinion and link motion will be found very convenient in lowering heavy loads, especially when exactness of position is required in placing the loads, as the engineer has absolute control over the motion of the engine at all times, and the engine can be instantly stopped, the load raised or lowered, by simply changing the position of the link.

The engines are provided with first class boilers, of ample capacity, making them easy to fire and insuring an abundant supply of steam. The boiler and engine are secured to the same frame, and are compactly placed. The entire machine is made of the best materials, put together in a good and workmanlike manner, is suitable for all hoisting purposes, pile-driving, etc., and is geared to raise from 2,000 to 4,000 pounds.

A BERLIN machine will supply 10,000 electric lamps.

POSTSCRIPT.

FRIDAY, DECEMBER 6, 1889.

THE BIGGEST YEAR OF ALL IN IRON ORE.

Thanks to the prompt responses of collectors of ports and railroad officials, *The Iron Trade Review* is enabled to lay before its readers, in this issue, the result of its inquiries as to the receipts of iron ore at Lake Erie ports, the amount of ore on dock at the close of navigation, and the aggregate sales for lower lake delivery during the season of 1889. The data thus obtained may be summarized as follows:

	18 9.	1888.
The amount of iron ore on dock at Lake Erie ports, at the opening of navigation in 1888 and 1889, respectively, was (gross tons)	558,753	703,720
The total receipts at Lake Erie ports for the seasons of 1888 and 1889 were	5,314,112	3,783,659
Making a total of	5,872,865	4,487,379
Of this amount there was shipped to furnaces, by rail, during the seasons of 1888 and 1889	3,265,759	2,638,824
Leaving on dock at Lake Erie ports, at the close of navigation	2,607,106	1,848,555

The record of sales for 1889 is unprecedented, as will be seen by the following statement:

	Gross Tons.
The unsold ore on dock at the close of navigation, 1888, amounted to	167,300
The receipts at lower lake ports in 1889 were	5,314,112
Making a total of	5,481,412
Deducting the unsold ore remaining over at close of navigation this year	70,000
We have, as the total sales for lower lake delivery during the shipping season of 1889	5,411,412
The corresponding sales of 1888 were	4,366,359
Showing an increase in 1889 sales of	1,045,053
And an increase over the sales of 1887 (which were 2,759,198 tons) of	2,652,214
The total shipments from Lake Superior ports for 1889 were	6,700,000
Subtracting the amount sold for lower lake delivery, viz:	5,411,412
We have a balance sold for delivery at Northwestern points of	1,288,588

The proportion of sold and unsold ore at lower lake ports we estimate as follows:

Date.	Sold.	Unsold.	Per cent. unsold.
December 1, 1884	388,135	650,000	62.6
December 1, 1885	918,940	130,000	12.4
December 1, 1886	896,472	70,000	7.2
December 1, 1887	858,861	750,000	48.1
December 1, 1888	1,681,255	167,300	9.
December 1, 1889	2,537,106	70,000	2.6

A detailed statement of receipts at each lower lake port since 1883, as gathered from official reports to *The Iron Trade Review*, is contained in the following table:

TOTAL RECEIPTS AT LOWER LAKE PORTS FOR SEVEN YEARS.

Port.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Toledo	27,617	2,444	15,000	26,960	61,729	75,601	82,951
Sandusky	58,825	106,540	143,180	157,970	160,600	154 924	186,082
Huron	.....	.....	.....	44.021	21,288	4,351	680
Lorain	25,794	30,156	13,180	99,744	134,764	197,000	280,000
Cleveland	723 129	904,852	589,234	1,034,650	1,276,423	971,775	1,390,283
Fairport	40,334	23,102	31,992	112,000	501,368	611,740	829,121
Ashtabula	670.00	650,000	582.0 0	672,000	1,103,839	1,288,530	1,955,530
Erie	106,787	116,027	122,223	91,250	21 ,488	240,338	291,455
Buffalo	40,203	8,760	7,162	31,859	28,699	240,000	298,.00
Total	1,692,689	1,841,877	1,503,969	2,270,554	3,439,198	3,783,659	5,314,112

The statistics of iron ore on dock at the close of navigation, from 1883 to 1889 inclusive, are shown in the subjoined table:

IRON ORE ON DOCK AT CLOSE OF NAVIGATION.

Port.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Toledo	25,000	18,000	12,000	15,000	50,000	53,254	85,340
Sandusky	44,083	72,834	87,457	80,000	65,' 00	100,000	175,000
Huron	.....	.....	.....	8,500	11,700	9,2 0	39
Lorain	25,611	35,907	34,346	69,304	110,000	100,000	170,000
Cleveland	428,634	482,238	494,683	464,971	487,327	527,626	518,816
Fairport	15,000	2,100	7,500	7,000	223,318	2'0,000	390 000
Ashtabula	291,878	349,306	331,110	285,697	522,516	686,833	1,071,011
Erie	95,369	77,750	81,844	35,000	89,000	95,092	128,900
Buffalo	17,500	None	None	None	None	26,500	68,000
Total	943,095	1,038,135	1,048,940	966,472	1,558,861	1,848,555	2,607,106

A study of the above figures will reveal at once a most remarkable growth in the Lake Superior iron ore industry during the past few years. While the year 1888 was unprecedented up to that time, in the shipment of iron ore to Lake Erie ports, this season's receipts are larger by 40 per cent. than last year's, while the sales of 1889 for lower lake delivery exceed those of 1888 by 1,045,053 tons, or 24 per cent. The increase of receipts in 1888 over 1887 was 5 per cent. and in 1887 it was 32 per cent. in advance of 1886. The receipts at Lake Erie ports this year, in other words, were far in advance of either 1887 or 1888, were more than double those of 1886, and more than treble those of 1885.

The amount of iron on dock at the close of navigation is the largest ever known, being 41 per cent. greater than last year; but this has no special significance in the market beyond demonstrating the fact that the railroads are exceedingly hampered in transporting the ore from the docks to the furnaces. The real test is the question, How much of the ore on dock remains unsold? From careful inquiry, we are enabled to state that the total amount of unsold ore at present on dock at Lake Erie ports is 110,000 tons; but of this 40,000 tons are unsaleable because exposed to the weather for years, while the balance, 70,000 tons, is so scattered along the lake ports that it is also practically unmarketable, so that the unsold ore at the close of the season of 1889, ostensibly only 2.6 per cent. of the aggregate tonnage on dock, is in fact practically *nil*.

Another phase of the subject, which we reserve for more thorough consideration hereafter, is the great drift of iron ore tonnage away from Cleveland. While this port shows a gain in receipts over last year of 43 per cent., our proportion of the total receipts is only 26 per cent., Ashtabula leading us, with 37 per cent. of the aggregate. In fact, Ashtabula, Fairport and Buffalo, which a few years ago played no figure in the ore business, now together take 60 per cent. of the aggregate receipts, and what is their gain has been Cleveland's loss. The largely increased receipts at Buffalo the past two years may be taken as indicating an important and growing demand for Lake Superior iron ore for consumption east of the Allegheny Mountains.

A Great Year for the Lake Shipping Interest.

Says the Cleveland *Plain Dealer:* The big ore, grain and coal carriers of the lakes have paid their owners about 12 to 15 per cent. during the past season. The inland marine, representing an aggregate capital of $53,000,000, has carried during the season now at its close 102,000,000 bushels of grain from Chicago, 10,000,000 from Duluth, 6,700,000 tons of iron ore from the Lake Superior mines to the blast furnaces and brought back 2,200,000 tons of coal from Buffalo and 2,000,000 tons from Ohio ports. These figures, vast as they are, represent only the business of the inland marine between Lake Erie and Lakes Michigan and Superior. The great lumber trade and the local trade on the five great lakes, each representing a traffic of many million dollars, are not included. In grain and ore no approach to these figures has ever been made. Coal and lumber show a decided falling off, however; in the former, transitory, and in the latter, permanent.

The shipments of iron ore from Lake Superior mines were made on a basis of the following rates per gross ton from Escanaba:

Date.	Rate.	Date.	Rate.	Date	Rate.
August 4	$ .90	September 27	$1.10	October 14	$1.25
August 19	1.00	September 30	1.15	November 1	1.15
August 21	.90	ctober 1	1.10	November 6	1.10
August 31	1.00	October 8	1.15	November 8	1.00
September 5	1.05	October 12	1.20	November 27	1.25

The Chicago *Tribune* adds this interesting information: Figuring on the basis of rates for the three principal items of freight—grain, ore and coal—there has been paid the lake marine for transporting the crops of the Northwest through Duluth and that part of the West tributary to the great lakes, $3,120,000. For the carrying of coal through Chicago there has been paid $2,400,000, while the ore has been transported for $8,500,000.

The season was remarkable for its comparative freedom from loss of life Twenty-three persons were lost in wrecks and collisions. The aggregate loss of life from all sources of accident was about sixty, all seamen, not a passenger in the number. The Canadian marine, small as it is in proportion, furnished about 45 per cent. of the casualties. In property value the reverse is true. The year has been one of losses which will aggregate nearly $1,500,000. Fully 80 per cent. of this was on steamers of the first class.

The most marked feature of vessel architecture has been the steadily growing tendency toward steel steamers, limited only by the depth of water. About 3,000 tons is the present limit. In all qualities that go to make up a good ship these steamer will compare to advantage with those engaged in the same class of trade on the Atlantic. They are practically free from danger except beaching in any lake storm, and are built to be good boats through the first half of the twentieth century.

In the last three years the lake tonnage has doubled, and in capacity for business the increase has been greater. In 1887 seventy-nine new ships were turned out from the ship-yards, and in 1888 sixty-two more were added. There are now under contract for construction forty-one ships, to cost $5.500,000.

ASIDE from its great value as a political paper, the New York *Tribune* has won an enviable position as an exponent of the business interests of the country. Always safe and conservative, its utterances have great weight with thinking men, while its special articles on business or metallurgical subjects are intelligently and clearly written. The iron-making constituency of *The Iron Trade Review* will find the *Tribune* of the utmost value in their special lines.

FACTS ABOUT CREDITS

It has been the practice of the General Mercantile Agencies to base credit ratings upon the amount of capital employed, almost, it may be said, in a fixed proportion—a firm possessing large capital receiving a correspondingly *high credit rating*, while on the contrary, those having limited capital (if rated at all) are reported as having *limited* or no credit whatever.

This system is unquestionably false, as affording an unjust discrimination against that class of business men who, while having small capital, are possessed of such business sagacity as always to employ their capital with prudence and safety, thereby giving assurance of their continued solvency. On the other hand, many firms that have large capital are so deficient in business qualifications as to be entitled to *no credit whatever*—and in addition, experience daily demonstrates that, owing to their greater tendency to extension and extravagance, as well as an undue confidence in the stability of their credit, their failures are more frequent and disastrous than those of their more conservative or more cautious neighbors. Sound judgment and prudent management, coupled with good character, habits and economy, appear, therefore, to be of more value in determining credit than the amount of capital employed; as these qualifications, added to promptness of payment, are unquestionable evidences of sound judgment and prudent management, they are adopted as the basis of credit ratings in Ealy's "Blue Book." The facts upon which credit must rest are presented in Ealy's "Blue Book," leaving to individual judgment the natural deductions.

The object and aim of Ealy's Agency is to afford to its members more perfect *protection against loss* than has heretofore existed. 1st. By preventing undue extension of credits. 2d. By repressing to its proper limits the credit of incapable, dishonest and irresponsible dealers. 3d. By giving timely warning of impending weakness of parties hitherto considered sound. 4th. By obtaining prompt, reliable and accurate information as to character, habits and responsibility of dealers. 5th. By supplying its subscribers with a *reliable* REFERENCE BOOK OF CREDITS *especially adapted to their trade.*

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This Agency publishes the "BLUE BOOK"—A REFERENCE BOOK OF CREDIT, containing the names, with capital and credit ratings, of over 350,000 dealers in HARDWARE, STOVES, PLUMBERS, STEAM AND GAS FITTERS, IRON, BRASS AND METAL WORKERS, Metals, Iron, Steel, Machinists, Agricultural Implements and General Country Stores. Do not subscribe for any agency book until you have first examined Ealy's "Blue Book." It is absolutely the only Agency book published in America giving a condensed, classified list of names of dealers in the above mentioned lines of trade. We will take pleasure in sending a copy of our "Blue Book" for inspection, *free of all express charges*, to any responsible manufacturer or jobber. Terms of subscription made known on application at either of our offices.—THE JOHN W. EALY COMPANY, 94 LaSalle Street, Chicago. 19 Milk Street, Boston. 280 Broadway, New York. 408 Olive Street, St. Louis. 106 Third Avenue, Pittsburgh.

INDUSTRIAL SUMMARY.

New Enterprises:—

It is reported that the Carpenter Steel Co., of Reading, of which Gen. John Newton, of New York, is president, has decided to locate its steel works permanently in New York city.

A charter has been granted, at Harrisburg, to the Hecla Iron Co., of Pittsburgh. The directors are Edwin H. Smith, Charles S. Crawford and Charles C. Morrow.

W. F. Lloyd, of Pittsburgh; P. E. Wollmar, of Cleveland; A. J. Boyce, of East Liverpool, O.; and John Porter, of New Cumberland, W. Va., are purchasers of land opposite East Liverpool, O. They contemplate erecting a large rolling mill, steel plant and probably car works.

The Central Railway Supply & Construction Co. has been incorporated at Indianapolis, to manufacture and deal in all kinds of railway supplies, equip railways and street railways. The capital stock is $50,000. Directors, John E McGettigan, Frank S. Foster, Lewis P. Horton, Frank A. Lapham and Ephraim C. Dawes.

A number of Allegheny capitalists held a meeting in that city Monday, and organized a company for the manufacture of merchant steel by the Wassel process. A preliminary meeting, at which the theory of the new prices was explained, was held a few days ago. At this meeting Mr. Wassel, the inventor, was requested to demonstrate the practicability of his invention. This he agreed to do, and a highly satisfactory test was made at the Keystone Mill on Friday last. It is thought that all necessary stock will be subscribed in a few days. The location for the new plant has not yet been selected.—[American Manufacturer.

The following new companies were granted licenses of incorporation by the Secretary of State of Illinois:—Chicago Belting Co., Chicago; to manufacture leather belting; capital, $50,000; incorporators, J. M. Thomas, James Maloney, F. S. Bennett.—The Tasker Steel Tube Co., Chicago; for manufacturing merchantable steel and boilers; capital $60,000; incorporators, W. S. Morse, G. B. Lathrop, O. B. Petters.—Daisy Manufacturing Co., Chicago; to manufacture hardware; capital, $250,000; incorporators, George Kelly, G. W. Ball, W. C. Goldner.—Mechanics' Foundry Co., Chicago; to do a general foundry and machine business; capital, $10,000; incorporators, Thomas Hoyer, B. M. Pettingill, C. W. F. Webber.

Enlargements, Additions, Removals, Etc.:—

E. C. Atkins & Co., Indianopolis, Ind., contemplate enlarging their saw works in the early Spring.

The Orange Iron Foundry Co. has sold to the New Home Machine Co. a double plant at Orange, Mass., for $15,000.

The capital stock of the Vancouver City Foundry & Machine Works, Vancouver, B. C., will be increased to $100,000, and the capacity of the works doubled.

The Long & Allstatter Co., Hamilton, O., are adding a story to their main building. The building is 60x200, and the improvement will make it four stories high.

The Cambridge Iron & Steel Co. have commenced building their $100,000 plant at Cambridge, O. The product will be iron and steel sheets. A. Beard has taken charge during the construction and will be business manager when operations are commenced. Mr. Beard was for a long time connected with the Standard Iron Co., Bridgeport, O. A. Beyer is president and W. C. Browne, treasurer.

Fires and Accidents:—

A disastrous fire occurred recently at the works of the Columbus (O.) Steel Range Co.

A fatal boiler explosion occured at the Allegheny Bessemer Steel Works, at Duquesne, November 26, and William Marshall, night superintendent, and Charles Cooper were killed. It is thought the water was allowed to run low and when the injector was started the explosion ensued.

The main shaft of the big engine in Oliver Bros. & Phillips' South Fifteenth street (Pittsburgh) mill broke down one day last week. The mishap will enforce a week's idleness on all the men and boys engaged in the finishing departments of that establishment and also of part of the South Tenth street mill.—[American Manufacturer.

A serious accident occurred Thursday of last week at the Spang Steel Works, at Etna, Pa. The accident was somewhat similar to that which occurred at the Homestead Steel Works some weeks ago. While some men were engaged pouring molten metal into an ingot mold, the metal boiled over, scattering in all directions, and six of the workmen were seriously burned. The accident was attributed to damp clay in the bottom of the ladle.

General Industrial Notes:—

Rathbone, Sard & Co., of Albany, N. Y., have broken ground for their new stove works in Aurora, Ill. Foundations will be laid for five buildings.

It is reported that the new rod mill of the American Wire Co., Cleveland, built by C. Morgan, is making from 75 to 80 tons of No. 9 rods per day, direct from 4-inch 200-pound billets.

E. E. Garvin & Co., of New York, have transferred all their right, title and interest to the Garvin Machine Co., who will continne the extensive business in the building of machine tools established by the old firm.

Like "carrying coals to Newcastle," the Seaton Manufacturing Co., Cleveland, are sending their bolt and rivet headers to Pittsburgh, Pa. They shipped one last week, which makes the third to that market. This is certainly a strong evidence of the great merit of their headers, and we are pleased to note the success of this new. enterprising company. We hope they may remain with us, though strong offers are made them to go elsewhere.

MAMMOTH STEEL PLATES.

Carnegie, Phipps & Co., limited, of Pittsburgh, Pa., exhibit at the Boston Maritime Exposition two mammoth specimens of steel plates which, set perpendicularly, tower nearly to the roof. These plates are tested to stand a pressure of 55,000 lbs. to the square inch. The Continental Iron Works of Brooklyn, New York, make exhibit of several corrugated cylindrical furnaces for steam boilers. These furnaces are welded at the joints and two welded flasks are shown capable of withstanding a pressure of 1,600 lbs. to the square inch.

N. Y. Tribune for 1890.

NEW FEATURES.

A BRILLIANT YEAR AHEAD.

During 1890, the New York TRIBUNE will be greatly improved in quality and made more lively, fresh and readable than ever before in its history. Among the special contributions during 1890 will be:

Andrew Carnegie, "Principles of Business Success."
Gail Hamilton, "European Monarchs."
Terence V. Powderly, "Restriction of Immigration."
Chauncey M. Depew, Senator John J. Ingalls, Mrs. John A. Logan, Rev. Dr. John R. Paxton and others, topics not announced.
Albert Griffin, "Temperance among Germans;" a new view.
Judge A. W. Tourgee, "The Colored Race in America."
S. C. T. Dodd, "The Advantages of Trusts."
"Josiah Allen's Wife," "The Small Salaries of Country Clergymen."
Senator Wm. M. Stewart, of Nevada, "Unlimited Silver Coinage."
Fred S. Tallmadge, on "Men of the Revolution."
Kate Field, "Morman Question"
Erastus Wiman, "Success and Failure Among Business Men."
Rev. Edward Everett Hale, "The New England of To-Day."
Bishop Henry C. Potter, "Rural Reinforcement of City Population."
Geo. W. Cable on "Some Strange Legislation in the South."
Marshall P. Wilder, "Humor of England and America."
* * * * "Evils of Trusts."
Henry W. Grady, of the Atlanta *Constitution*, "Chances for Capital in the New South."
I. C. Russell, United States Geological Survey, "Highest Peaks of the United States."
W. M. Grosvenor, "Gold and Silver as Money."
C. E. Quigg, "What is left of Our Public Lands."
Emily Huntington, "Household Science."
Ernest Whitney, "Peculiarities of American Pronunciation."
Professor William Pepper, President of University of Pennsylvania, "A college education good for all; what is best for those who cannot get it."
M. Y. Beach, "Slayer of 430 Bears."
☞ **Other contributors will be announced hereafter.** The articles will cost many thousands of dollars and appear in THE TRIBUNE only.

SOLDIERS' STORIES.

THE TRIBUNE will also print, in adition to its regular G. A. R. and S. of V. page, a number of entertaining **Stories of Actual Experience in the War,** not less than 25 in number, each a page of THE TRIBUNE in length, by privates and officers of the Union, of a rank not higher than that of captain. Veterans are invited to contribute to this series of stories. Every tale accepted will be paid for at regular newspaper rates. Prizes of $250, $150, and $75 will be paid for the best three. Manuscripts must be enclosed to "THE TRIBUNE, New York," and inscribed "Soldiers' Department."

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In addition to our regular and extremely able agricultural department (two pages a week), THE TRIBUNE will print a number of long and carefully prepared articles on **Particular Branches of Farming,** written by practical experts. Farmers who want to make money out of their farms must read these special discussions in THE TRIBUNE. The

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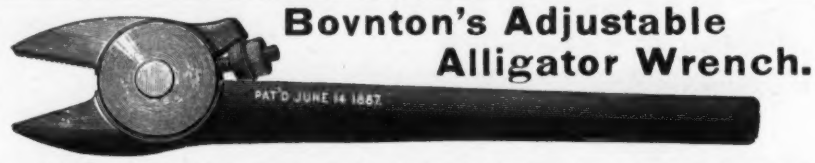

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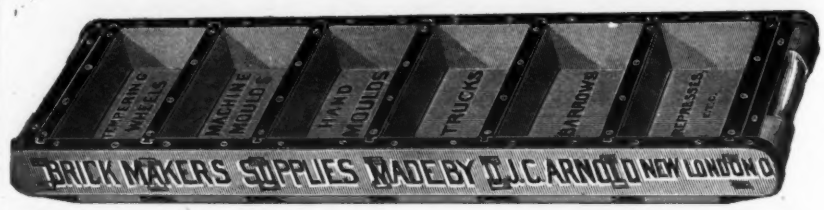

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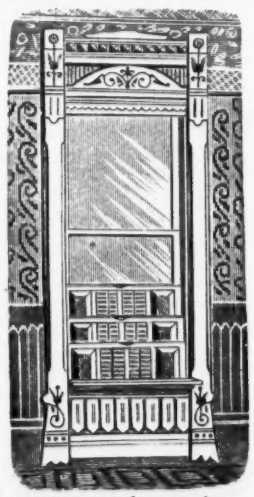

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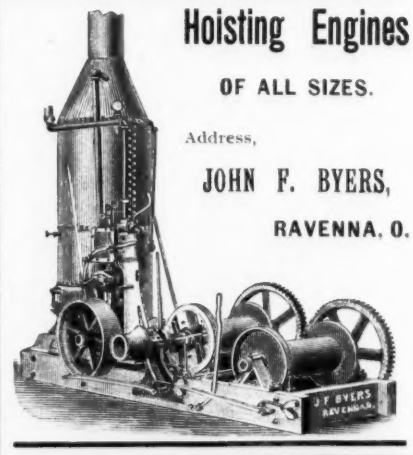

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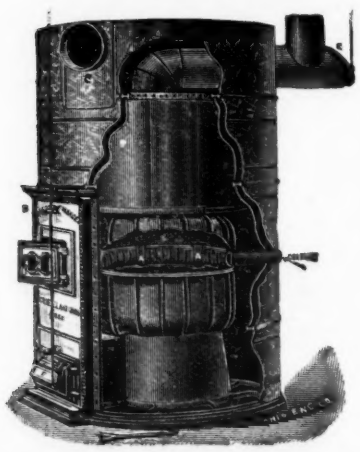

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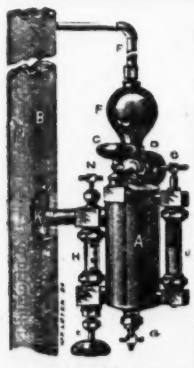

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Simple in operation and always reliable.

A lubricator sent on 30 days' trial to responsible persons.

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Exclusive Manufacturers

Nos. 7, 8, 9, 10 and 12.

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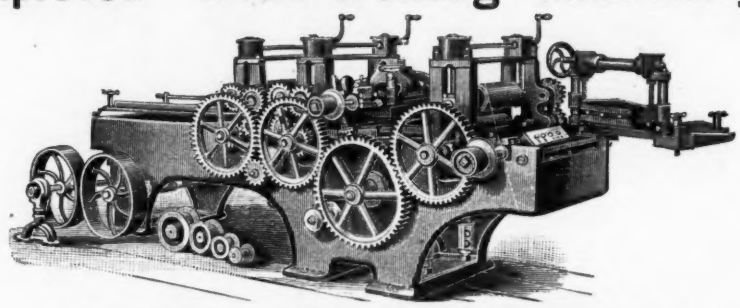

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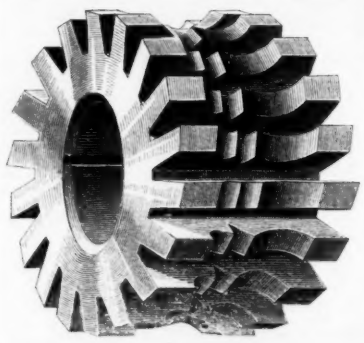

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Specially adapted for A No. 1 Boiler Plates, Boiler Rivets, Wire Rods, Stay Bolts, Stamping Ware Nail Plates, etc. Will contract to completely erect, equip and place in operation blast furnaces, Whitwell stoves and steel plants as above. As I manufacture at my own works, everything appertaining to blast furnace and steel works construction I can guarantee promptness and satisfaction.

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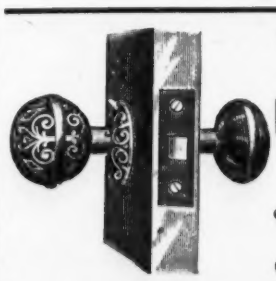

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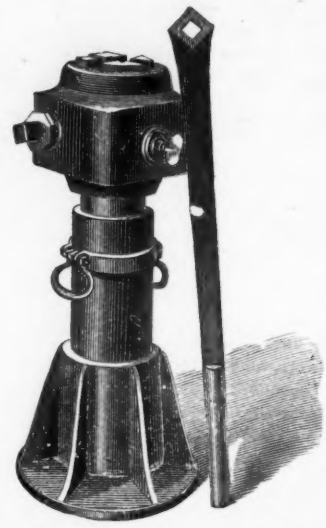

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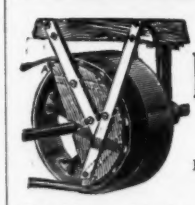

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BETTER THAN LOOSE PULLEYS.

Shifts Belt from Driving Pulley.

Belt stops when machine stops and lies slack until machine starts. Simple, cheap, easily operated. Sent on approval. Thousands in use. Address

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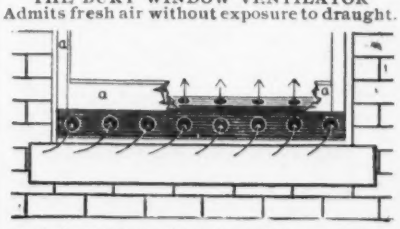
THE BURY WINDOW VENTILATOR

Admits fresh air without exposure to draught.



It is just the the thing for public and private offices, bed-rooms, school-rooms, sewing-rooms lecture-rooms, factories, etc.

It purifies the air, preventing colds, headaches and drowsiness.

No water cure establishment, sanitarium or hospital should be without it.

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The outside air being admitted in so many sections is easily warmed before turning to descend to the floor, and is readily diffused.

The effect is heightened by the action at center of window.

A season's trial of it will charm you and you will agree with all who are familiar with it, that it is by far the simplest, best and cheapest ventilator ever presented to the public and is within easy reach of all.

Agents and canvassers wanted everywhere.

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Manufacturers of REFINED AIR FURNACE MALLEABLE IRON.

Superior advantages on account of Natural Gas Fuel. Aiso manufacturers of Curry-Combs, Hardware and Saddlery Hardware Specialties. ☞Write for Price List and Catalogue.

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CLEVELAND (f. o. b. cars, four months): Bessemer, $23 30; No. 1 Foundry, $19 30; No. 2 Foundry, $18 30; No. 1 Gray Forge, red short, $17 80; No. 2 Gray Forge, neutral, $17 30; No. 1 American Scotch, $19 30; No. 2 American Scotch, $18 30.

CHICAGO (reported by Messrs. Rogers, Brown & Co.): Ohio Silveries No. 1, $19 00@19 50; Ohio Silveries No. 2, $18 50@19 00; Ohio Strong Softeners No. 1, $19 25@19 75; Ohio Strong Softeners No. 2, $18 25@18 75; Lake Superior Charcoal Nos. 1 to 6, $21 00@22 00; Tennessee Charcoal No. 1, $20 00@20 50; Tennessee Charcoal No. 2, $19 50@20 00; Southern Standard Car Wheel, $25 00@26 00; Tennessee Standard Car Wheel, $20 50@21 50; Hanging Rock Standard Car Wheel Cold Blast, $26 00@28 00; Hanging Rock Standard Car Wheel Warm Blast, $22 00@24 00; Old Car Wheels, $21 00@00 00.

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and SouthernCoke No. 1, $17 50@1900; Ohio and Southern Coke No. 2, $17 00@18 50; Ohio and Southern Coke No. 3, $16 50@18 00; Ohio Soft Stone Coal No. 1, $18 00@18 50; Ohio Soft Stone Coal No. 2, $17 00@17 50; Hanging Rock Charcoal No. 1, $21 00@23 00; Hanging Rock Charcoal No. 2, $20 00@22 00; Tennessee and Alabamba Charcoal No. 1, $19 00@19 50; Tennessee and Alabama Charcoal No. 2, $18 00@18 50. FORGE—Strong Neutral Coke, $17 00@17 50; Mottled Neutral Coke, $16 00@16 50; Cold Short Coke, $16 00@16 50. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $23 00@24 00; Hanging Rock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $22 00@23 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $18 25@18 75; Southern Coke No. 2 Foundry (new classification), $17 75@18 25; Southern Coke No. 3 Foundry (new classification), $17 25@17 75; Grey Forge, $16 75@17 25; White and Mottled, different grades, $15 50@16 50; Silver Grey, different grades, $16 25@17 25; Southern Charcoal No. 1 Foundry, $18 50@19 50; Southern Charcoal No. 1 Mill, $17 00@17 50; Southern Car Wheel, Standard brands, $23 50@24 50; Southern Car Wheel, other brands, $19 25@21 75; Hanging Rock Coke No. 1 Foundry, $18 50@19 00; Hanging Rock Charcoal No. 1 Foundry, $22 00@22 50; Hanging Rock Cold Blast, $24 00@26 00; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $19 00@19 50; Southern coke No. 2, $18 75@19 00; Southern coke No. 3, $18 00@18 75; Mahoning Valley (Lake ore mixtures), $20 00@00 00; Southern charcoal, No. 1, $18 50@19 00; Southern charcoal, No 2, $18 50@19 00; Missouri charcoal, No. 1, $18 50@20 00; Missouri charcoal, No. 2, $19 00@19 50. FORGE—Neutral coke, $17 50@18 50; Cold short, $16 25@16 75; Mottled, $15 50@16 00. CAR WHEEL AND MALLEABLE—Southern (standard brands), $23 50@24 25; Southern (other brands), $19 50@20 50; Lake Superior, $23 00@23 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $00 00@19 50; Southern Coke No. 2, $00 00@19 00; Southern Coke No. 3, $00 00@18 50; Southern Grey Forge, $00 00@18 00; Southern Charcoal No. 1, $18 50@19 00; Southern Charcoal No. 2, $17 50@18 00; Missouri Charcoal No. 1, $18 50@19 00; Missouri Charcoal No. 2, $17 50@18 00; Ohio Softeners, $19 00@20 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $22 00@23 00; Southern, $19 00@24 00. CONNELLSVILLE COKE—East St. Louis, $5 25; St. Louis, $5 40.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $19 70@20 20; Mahoning and Shenango Valley strong, No. 2 Foundry, $18 70@19 20; Niagara No. 1, $19 75@00 00; Niagara No. 2, $18 75@00 00; Niagara No. 3, $17 75@00 00; Ohio Softener No. 1, $19 75@00 00; Ohio Sofener No. 2, $18 75@00 00; Lake Superior Charcoal, $21 50@22 50; Tennessee Charcoal, $22 00@00 00; Southern Softener No. 1, $20 00@00 00; Southern Softener No. 2, $19 25@00 00; Alabama Car Wheel, $26 00@00 00; Hanging Rock Charcoal, $24 50@00 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $21 00@21 50; Lake Superior Charcoal, Bessemer, $21 00@22 00; Lake Superior Coke, Bessemer, $22 50@22 75; Lake Superior Coke, all Ore, $20 00@21 00; Lake Superior Coke, Cinder Mixed, $18 25@18 75; Standard Ohio Black Band, $20 00@21 00; Southern No. 1, $18 25@18 50; Southern Gray Forge, $16 25@16 50; Southern Silvery, $16 50@17 00; Jackson County (Ohio) Silvery, $19 25@19 75; Old Wheels, $19 00@19 75; Old Iron Rails, 25 00@25 50.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $18 50@18 75; No. 2 Foundry, $17 50@17 75; Grey Forge, $16 75@17 00; White and Mottled, $15 50@15 75; Warm Blast Charcoal, $18 00@22 00; Cold Blast Charcoal $24 00@28 00; Bessemer, $20 00@21 00.

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Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 95
4½ to 6 by ⅜ to 1 inch	2 05
1¾ to 6 by 1⅛ to 2 inch	2 35
1¼ & 1⅜ by ⅜ to ¾ inch	2 05
1 & 1⅛ by ⅜ to ¾ inch	2 05
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 45

Round and Square.

1 to 1⅜ inch	1 95
2 to 2⅜ inch	2 15
2¾ to 3¼ inch	2 45
3⅜ to 4 inch	2 95
4¼ to 4½ inch	3 45
4¾ to 5 inch	3 65

Oval.

⅞ to 1¼ inch	2 35
⅝ to ¾ inch	2 55
½	2 75
⅜	3 15

Half Oval and Half Round.

1½ to 3 inch	3 05
⅞ to 1¼ inch	2 65
⅝ to ¾ inch	3 15
½	3 45
⅜	4 95

Heavy Band.

1½ to 6 by ¼ and 5-16 inch	2 05
1 to 1⅜ by ¼ and 5-16 inch	2 25
¾ to ⅞ by ¼ and 5-16 inch	2 45
½ to ⅝ by ¼ and 5-16 inch	2 95

Hoops.

1¼ to 4, Nos. 13 to 15	2 80
1¼ to 2, Nos. 16 to 18	2 90
1¼ to 2, No. 19	3 00
1¼ to 2, No. 20	3 10
1¼ to 2, No. 21	3 20
1¼ to 2, No. 22	3 30
15-16, 1 and 1⅛, Nos. 13 to 15	3 00
15-16, 1 and 1⅛, Nos. 16 to 18	3 10
15-16, 1 and 1⅛, Nos. 19 and 20	3 20
15-16, 1 and 1⅛, No. 21	3 30
15-16, 1 and 1⅛, No. 22	3 50
⅞, Nos. 13 to 15	2 20
⅞, Nos. 16 to 18	2 30
⅞, Nos. 19 and 20	2 40
⅞, No. 21	3 50
⅞, No. 22	3 60
13-16, Nos. 13 to 15	3 40
13-16, Nos. 16 to 18	3 50
13-16, Nos. 19 and 20	3 60
13-16, No. 21	3 70
13-16, No. 22	3 80
¾, Nos. 13 to 15	3 50
¾, Nos. 16 to 18	3 60
¾, Nos. 19 and 20	3 70
¾, No. 21	3 80
¾, No. 22	3 90
11-16, Nos. 13 to 15	3 70
11-16, Nos. 16 to 18	3 80
11-16, Nos. 19 and 20	3 90
11-16, No. 21	4 00
11-16, No. 22	4 10
⅝, Nos. 13 to 15	4 20
⅝, Nos. 16 to 18	4 00
⅝, Nos. 19 and 20	4 20
⅝, No. 21	4 30
⅝, No. 22	4 40
⅝, No. 23	4 50

Light Band.

1½ to 6 by 1/16 to 3-16 in	2 40
1½ to 6 by Nos. 11 and 12	2 50
1 to 1⅜ by 1/16 to 3-16 in	2 50
1 to 1⅜ by Nos. 11 and 12	2 60
⅞ and 13-16 by 1/16 to 3-16 in	2 80
⅞ and 13-16 by Nos. 11 and 12	2 90
¾ and 11-16 by 1/16 to 3-16 in	3 10
¾ and 11-16 by Nos. 11 and 12	3 20
⅝ and 9-16 by 1/16 to 3-16 in	3 40
⅝ and 9-16 by Nos. 11 and 12	3 45
½ by ⅜ to 3-16 in	3 65
½ by Nos. 11 and 12	3 75

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 80
⅞ inch, " " " 13 and 14	3 05
¾ inch, " " " 11 and 12	3 05
¾ inch, " " " 13 and 14	3 25

Sheet Iron.

No. 10 to 14	2 60
No. 15 to 17	2 85
No. 18 to 21	2 95
No. 22 to 24	3 20
No. 25 to 26	3 30
No. 27	3 40
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
C H No. 1 " "	3 10
C H Flange, " "	3 85
Extra Flange, "	4 35
Solid Fire Box, "	5 10

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 80
Shell	3 20
Flange	3 50
Marine Flange	3 90
Fire Box	4 60

Above includes plates 90 inches wide.

90 to 96 in. wide	½c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

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	cts. ℔s
2 to 9-16 wide by 2 to ⅜ thick	0

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Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel O Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

Bessemer and O. H. Steel.

	ct. ℔
Machinery base price,	02¾
Tire "	02¾
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Toe Calk "	03
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English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

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½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

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	NET TONS
No. 1 R. R. wrought scrap	$20 50
No. 1 wrought scrap	19 00
No. 1 Machine cast scrap	13 00
Pipes and Flues (clean)	23 00
Iron axles	24 00
Axle turnings	14 50
Wrought turning (free from cast)	13 00
Cast borings	9 00
Uncut wrought iron boilers	12 00
Steel boiler plates	13 00
Grate Bars	8 50
Pipes and flues (Clean)	12 75
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 00
Wrought drillings	11 00
Malleable iron	9 50

	GROSS TONS
Old iron T rails	24 00
Old steel rails	18 00
Old car wheels	17 00
Old copper	℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

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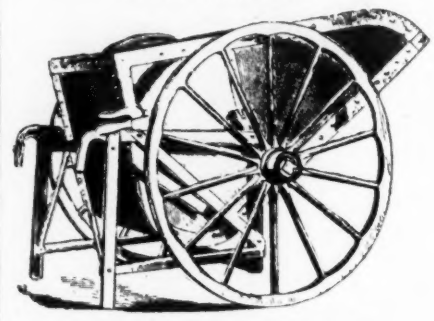

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LINDEN STEEL CO., L't'd. Steel Plate, Cold Condensed Shafting and Bar Steel of all kinds.

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AND METALS.

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Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

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Gear and Rack Cutting, Milling and Index Drilling to Order.

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American.....₩ lb 9@10
Wrights.....₩ lb 9½

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70@70& 5
" " " extra.....dis 60&5@60&10
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard.dis 60&10
Shultz Raw Hide Leather Belting, single, ...dis 35&5
Shultz Raw Hide Leather Belting, double, and Light Double.....dis 35&5
Standard, oak tanned.....dis 55@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9½@10½

Chalk.

White .....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers. .....dis 25
" Drill.....dis 35
Wescott's Scroll Combination.....dis 30
" Independent.....dis 40
" Little Grant Drill.....dis 30
Horton's Universal & Ind.....dis 40
National Combination.....dis 40
Sweetland " .....dis 40
Skinner " .....dis 40
" Independent.....dis 40
Almond Drill.....dis 25
Morse " .....dis 15
Skinner " .....dis 30

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Stocks.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1½".....dis 50&10
Morse Taper and Straight shank Larger than 1½".....dis 25
Drill Sockets.....dis 25
Standard.....dis 50&10
Cleveland.....dis 50&10
Maneer's bench.....dis 50&25
Maneer's post.....dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4¼c	5¼c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6¼c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 40@46
H. H. Barton.....dis 40@46

Emery Wheels.

Detroit.....dis 50@60
Norton's.....dis 55@60
Grant.....dis 55@60
Union Stone.....dis 60
Sterling.....dis 60
Vulcanite.....dis 15@20
Celluloid.....dis 25
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 65@70
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3½
Hexagon	15½	11½	8½	6	5¾	5¾	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate
{ Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 70
Sheet Rubber.....₩ lb 12@24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15¼
Sisal, ½ inch and over .....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis 40@40&10
H. H. Barton's.....dis 40@40&10
New England Flint.....dis 40@40&10
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll .....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay .....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 55
Machine, round head, iron.....dis 50
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls		21C@29C
No. 18 " " ¼ and ½ "		18c@28c
No. 36 " " ¼ and ½ "		16c@27c
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)		11½c
3-Ply " 1lb Balls		12@12¼c
3-Ply " 1½ lb Balls		11@11¼c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30
Maneer's machinist.....dis 50&10

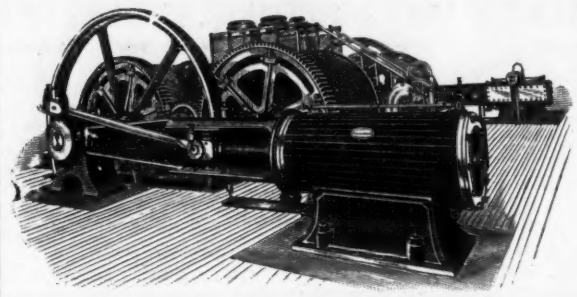
Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40



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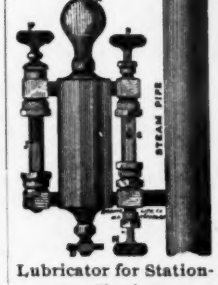

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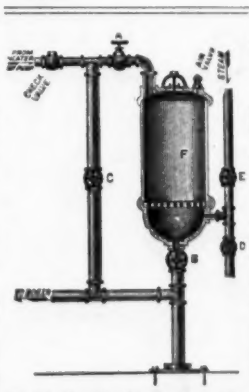

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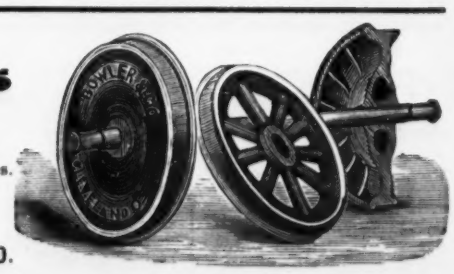

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Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩dox. $6 25@6 75
Others.....₩doz. $5 75@6 00
Full polished.....$8 25

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&10&10
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 80
Cast brass, loose joint.....dis 33⅓&10
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70&10
Loose joint, jap.....dis 70&10
Loose joint, jap. with acorns.....dis 70&10
Loose pin, acorns.....dis 70&10
Loose pin, japanned acorns.....dis 70&10
Loose pin, acorns, jap. plated tips.....dis 70&10
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10
Wrought, fast joint, broad.....dis 70&10
Wrought, loose joint, broad.....dis 70&10
Table Butts, back flaps, etc.....dis 70&10
Regular inside blind.....dis 70&10
Light inside blind.....dis 70&10
Loose pin.....dis 70&10
Light loose pin.....dis 70&10

Chains.

Trace, 6½-10-2.....₩ pair 1.03
Trace, 6½-10-3.....₩ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₩ lb 5½@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75&5@75&10
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Gangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No.	10	9	8	7	6	
Ausable,	₩ lb.	23	24	25	26	28	dis 25&10@25&10&10
Putnam,	₩ lb.	18	19	20	21	23	dis 15
Essex							dis 25&10@25&10&10

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R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
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Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

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Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps,genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs. genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@00
Pitcher spout,best makers dis 60&10@60&10&10
Pitcher spout,cheaper goods dis 70&5@70&10&5

Pokes, Animal.

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Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

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Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.
American iron carpet tacks all kinds dis 72½&10
Steel carpet tacks all kinds.....dis 72½&10
Swedes iron carpet tacks, all kinds...dis 75&10
Swedes iron tacks.....dis 72½&10
Swedes iron Upholsterers' tacks.....dis 72½&10
Tinned Swedes iron tacks.....dis 75&10
Tinned Swedes iron Upholsterers' tacks.....dis 75&10
American iron cut tacks.....dis 75&10
Copper tacks.....dis 50&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10
Finishing nails.....dis 67½&10
Hungarian nails and miners' tacks...dis 70&10
Gimp and lace tacks.....dis 67½&10
" " " tinned.....dis 77½&10
Trunk and clout nails.....dis 70&10
Tinned trunk&clout nails.....dis 70&10
Basket nails.....dis 70&10
Chair nails.....dis 70&10
Common and patent brads.....dis 70&10
Tinned capped trunk nails.....dis 60

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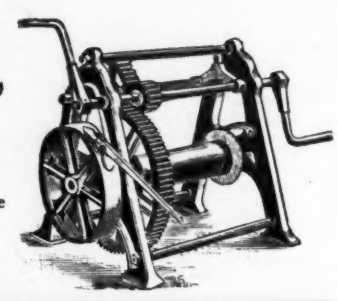

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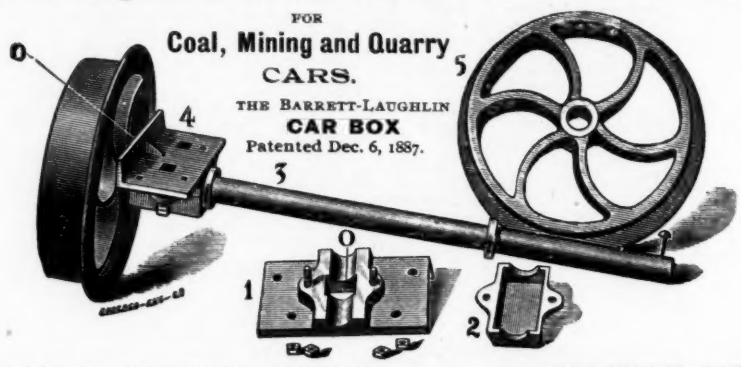

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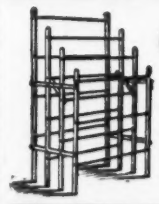

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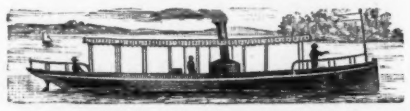

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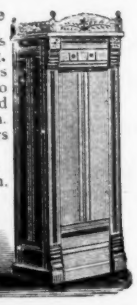

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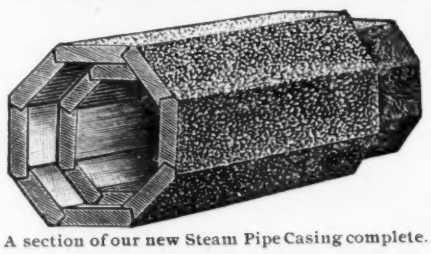

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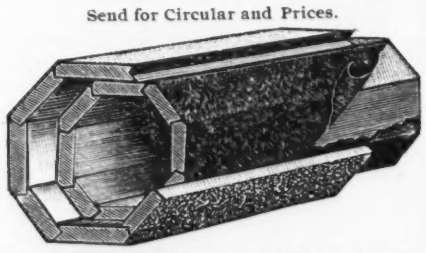

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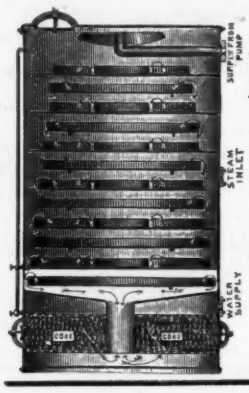

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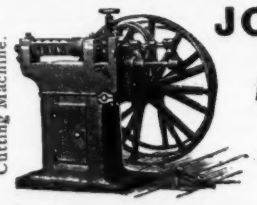

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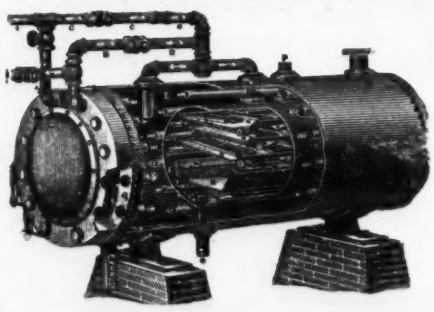

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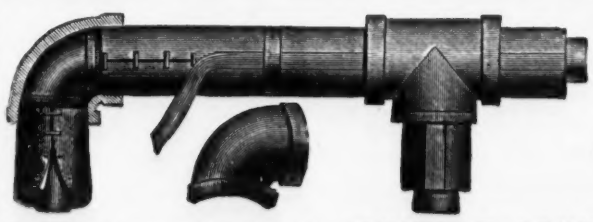

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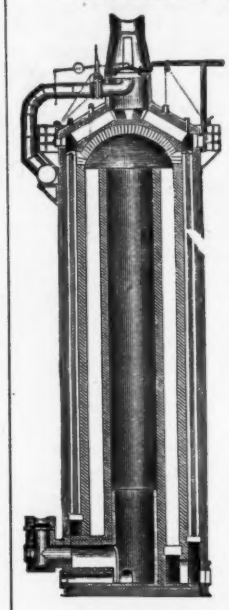

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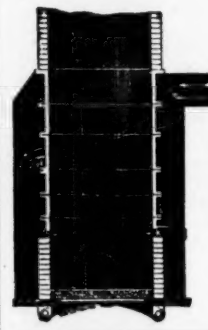

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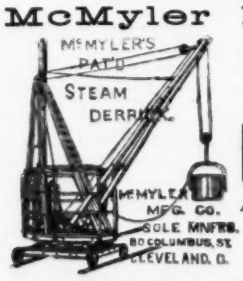

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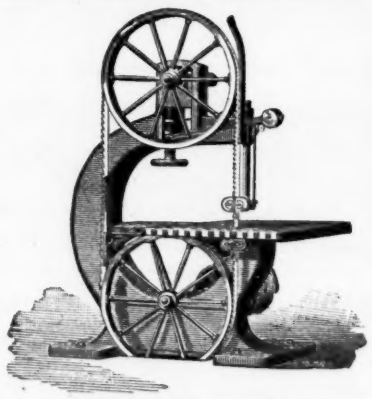

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TRAVELERS' REGISTER.

Standard Time.

Revised March 6th, 1888.

N. Y., C. & St. L. R. R. Co.—"The Nickel Plate."

Eastward.	Arrive.	Depart.
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	.....
Local Freight	4 30 p m	.....
Westward.	**Arrive.**	**Depart.**
Chicago Passenger	.....	6.30 a m
Fostoria Passenger	5 06 p m	5 11 p m
Local Freight	1 00 p m	.....

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

Euclid Accommodation departs 6:20 a. m.; 4.55 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburgh.

	Arrive.	Depart.
New York Express	12 50 p m	8 00 a m
New York Express	6 35 p m	1 05 p m
Alliance & Akron Accom	9 40 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	*5 25 a m	*11 10 p m

*Daily; all other trains daily, except Sunday.

Mt. Vernon & Pan Handle Route.

C., A. & C. Ry. Co.	Arrive.	Depart.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express	7 00 a m	8 00 p m
Akron, Col. & Zanesv'e Ex.	12 50 p m	1 05 p m
Akron & Orrville Accom.	9 40 a m	3 25 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily, except Sunday.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo	.....	†6 40 a m
Pittsburgh Express	†6 25 p m	.....
Youngstown Local	†8 05 a m	.....
Mahon'g div. & Pitts Local	.....	*11 40 a m
Mahoning Val. Accom	.....	†4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.
Canton and intermediate stations (Sundays only), 8:00 a. m., 4:20 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m, 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.
Canton and intermediate stations (Sundays only), 9:55 a. m., 6:30 p. m.
Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail	*7 45 a m	*6 25 p m
Marietta Express	†11 15 a m	†2 25 p m
Valley Junction Express	*4 15 p m	*10 25 a m
Cleve. and Canton Express	*7 05 p m	†8 20 a m

*Daily. †Daily, except Sunday.

WM. THORNBURGH, Gen. Manager. R. A. CARRAN, Gen. Pass. Agt.

Cleveland, Lorain and Wheeling.

All trains arrive and leave the Union Depot as follows:

	Depart.	Arrive.
Wheeling Express	6 45 a m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

OSCAR TOWNSEND Gen. Mang'r.

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—TO—
New York, Boston and the East.

The shortest and quickest Route to Pittsburgh, Washington and Baltimore & the Southeast.

New Central Depot So. Water St. and Viaduct.

	Depart.
No. 62, Accommodation	† 6 05 a m
No. 72, New York Express	* 8 10 a m
No. 72, Fast Pittsburgh Express	* 8 10 a m
No. 64, Fast Pittsburgh Express	* 3 00 p m
No. 66, Mantua Accommo	* 4 20 p m
No. 68, New York Vestibule Limited	* 8 30 p m
No. 70, Pittsburgh Local Express	*11 25 a m
No. 74, Pittsburgh & Youngst'n Ex.	†11 00 p m
	Arrive.
No. 65, Fast New York Express	*10 15 a m
No. 61, N. Y. & Pittsburgh Express	* 7 15 a m
No. 71, Leavittsburg Local	† 2 10 p m
No. 67, Pittsburgh Express	*12 45 p m
No. 63, New York Express	* 6 50 p m
No. 63, Pittsburgh Express	* 6 50 p m
No. 69, Pittsburgh Local Express	† 9 10 p m
No. 73, Mantua Accommo	* 7 20 p m
No. 75, Pittsburgh & Youngst'n Ex.	† 2 55 a m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland.

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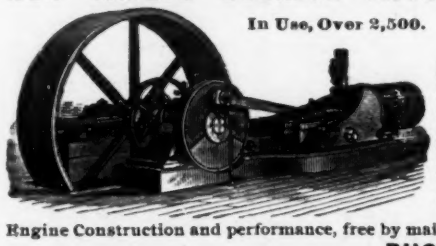

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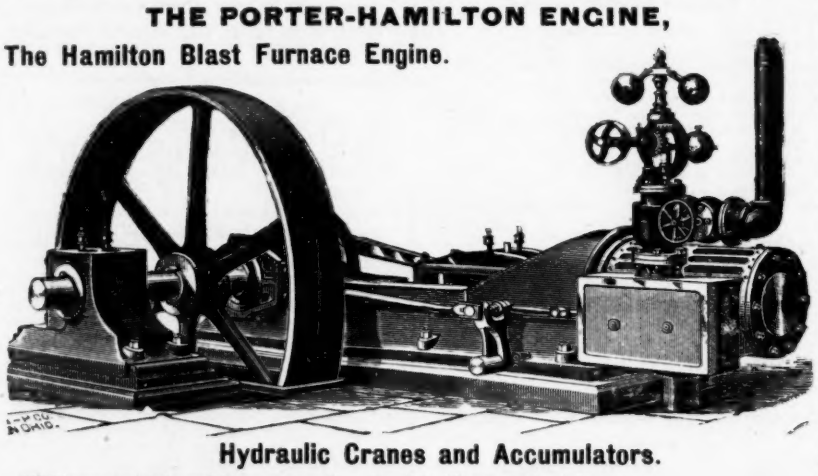

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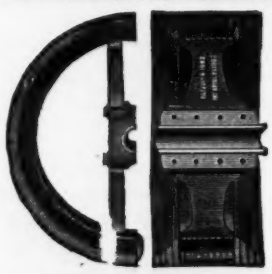

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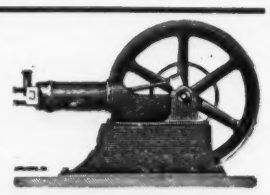

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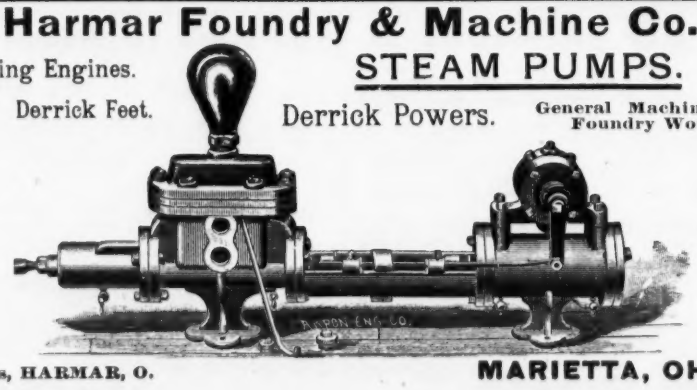

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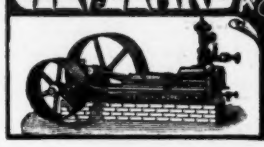

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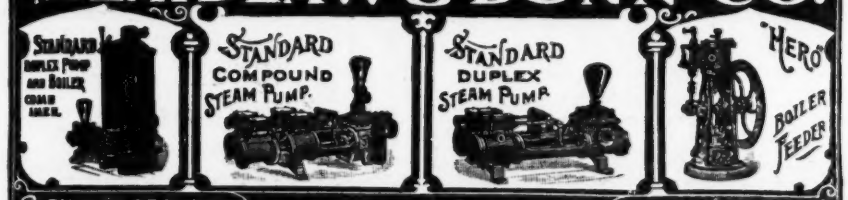
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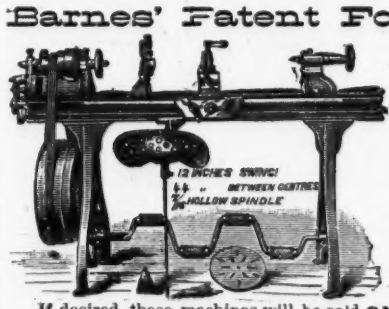

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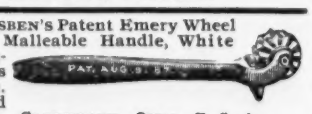

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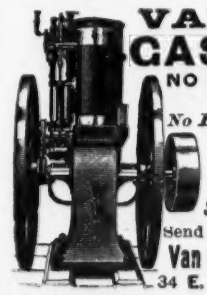

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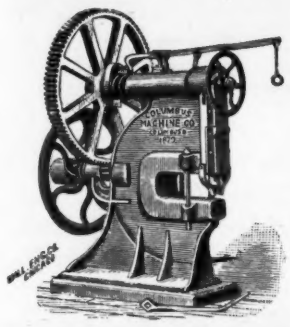

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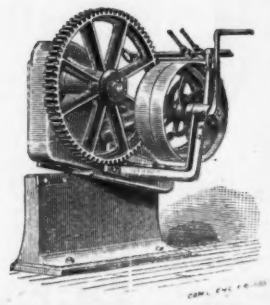

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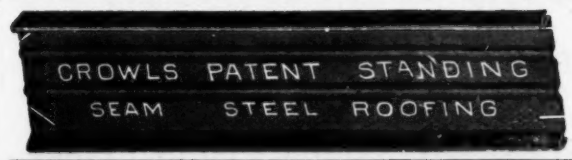

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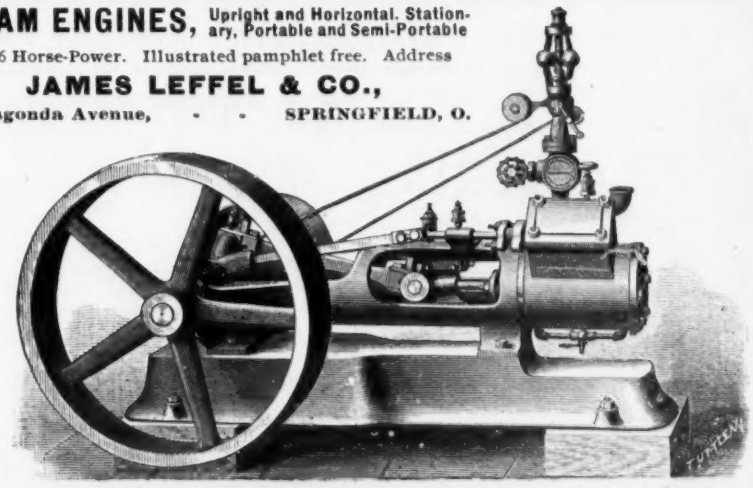

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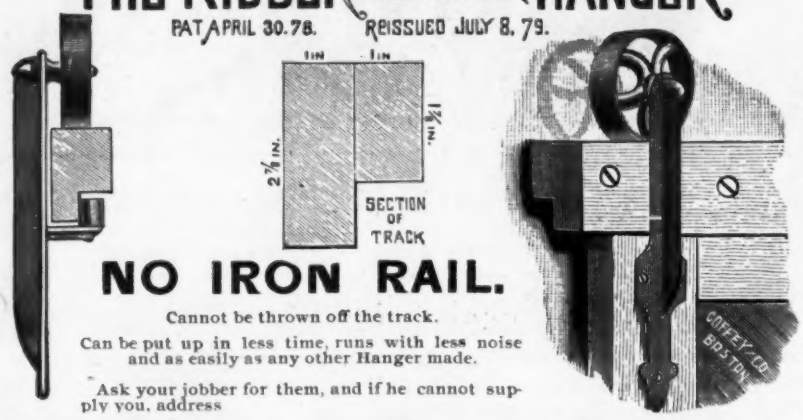

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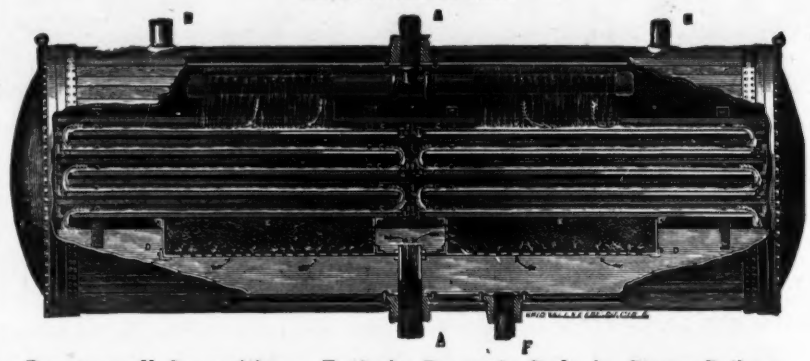

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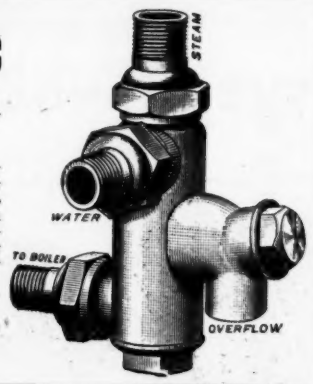

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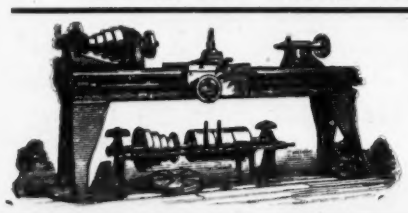

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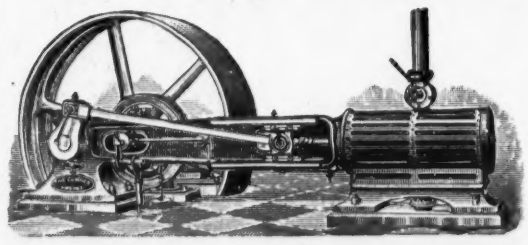

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